1.1.1: Curricula developed and implemented have relevance to the local, regional, national, and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes(COs) of the Programmes offered by the institution



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PEOs, PSOs & COs

GRBT-20 B.Tech Civil Engineering

Course outcomes (CO's) of all courses of all programs offered by the institution

DEAPRTMENT OF CIVIL ENGINEERING

Department Vision: To be the best Civil Engineering department in the region by means of good teaching, research and consultancy that serves the society

Department Mission:

- Arranging field visits, guest lectures and interactive sessions with subject experts
- Creating a strong bond between industrial needs and academic research outcomes
- Undertaking collaborative projects which offer opportunities for long-term interaction between academia and industry
- Promoting the career of the faculty members by encouraging their research work
- Adopting best teaching practices, imparting employability skills and empowering to become entrepreneurs in the trade

Program Educational Objectives (PEOs):

PEO1	Learning new technologies and/or undertaking higher education.
PEO2	Leading a team of engineers in executing projects.
PEO3	An entrepreneur in civil engineering community and/or a leadership role exhibiting systematic approach to resolve societal problems with ethical values.

Program Educational Objectives (PSOs):

PSO's	**PSO1:** Get proficiency in management and communication skills to become an entrepreneur. **PSO2:** Ability to use earth sciences in execution of civil engineering projects.

Program Outcomes (POs): Engineering Graduates will be able to:

- PO-1. Apply knowledge of computing, mathematics, science and engineering basics related to Civil Engineering.
- PO-2. Identify the problems and analyse the solutions by simulating, conducting experiments and interpreting data.
- PO-3 Design civil engineering structures to meet industrial needs.
- PO-4 Explore and investigate contemporary engineering problems and proposed solutions.
- PO-5 Use latest techniques, skills and modern machinery for engineering practices.
- PO-6 Propose civil engineering solutions to solve societal problems.
- PO-7 Design sustainable systems in congruence with social and environmental issues.
- PO-8 Practice professional ethics with legal awareness and societal responsibilities.
- PO-9 Work as an individual or in a team to achieve targets.
- PO-10 Articulate thoughts and ideas effectively at different levels.
- PO-11 Manage financial and human resources for better execution of project.
- PO-12 Participate in lifelong learning process.

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Course outcomes for First Year First Semester Course	
Course Code: 201HB101	
Course Title: Mathematics - I	
CO1:	Transform the knowledge of solving system of linear equations using matrices.
CO2:	Evaluate nature of the Quadratic form.
CO3:	Acquire the knowledge maxima and minima of function of several variables.
CO4:	Evaluate multiple integrals and their applications.
CO5:	Understand and apply vector derivatives and vector integration theorems.
Course Code: 201HB102	
Course Title: Communicative English - I	
CO1:	Develop effective reading strategies
CO2:	Demonstrate writing skills that are required for professional development and use graphic elements for communication.
CO3:	Apply grammatical skills and vocabulary effectively in speech and writing
CO4:	Display language efficacy in tune with subjective knowledge
CO5:	Use required language along with contextual vocabulary and grammar structures
Course Code: 201HB103B	
Course Title: Engineering Chemistry	
CO1:	Understand the removal techniques of hardness of water
CO2:	Distinguish the fuel cells and batteries
CO3:	Identify different control techniques of corrosion
CO4:	Understand the concepts of plastics and rubbers
CO5:	Analyse the importance of nano materials
Course Code: 201HB202a	
Course Title: Applied Physics	
CO1:	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution
CO2:	To demonstrate the concept on the absorption and spontaneous and stimulated emission in two level system and the conditions for laser amplification and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics. and classify the magnetic materials based on susceptibility and their temperature dependence.
CO3:	To study the Schrödinger equation for standard systems with both analytical and numerical methods, and then interpret the results. And to explain the physical states of elementary particles and atoms in different systems based on quantum mechanics
CO4:	To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors
Course Code:	
Course Title: Applied Physics Laboratory	
CO1:	To handle optical instruments like microscope and spectrometer, determine thickness of a hair/paper with the concept of interference and to estimate the wavelength and resolving power of different colors using diffraction grating
CO2:	To demonstrate the importance of dielectric material in storage of electric field energy in the capacitors and plot the intensity of the magnetic field of circular coil carrying current with varying distance
CO3:	To evaluate the resistivity of the given semiconductor using four probe method
CO4:	To identify the type of semiconductor i.e., n-type or p-type using Hall effect and determine the band gap of a given semiconductor
Course outcomes for First Year Second Semester Course	
Course Code: 201HB212	
Course Title: Communicative English Laboratory	

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CO1:	Learn to communicate in English
CO2:	Comprehend native speaker's accent
CO3:	Speak appropriately in real life situations
CO4:	Display public speaking skills in the required context
CO5:	Handle different communicative situations
Course Code: 201HB201	
Course Title: Mathematics – II	
CO1:	Solve first order differential equations.
CO2:	Solve higher order differential equations with constant coefficients
CO3:	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems.
CO4:	Understand numerical differentiation and integration.
CO5:	Apply the knowledge of different algorithms for approximating the solution of ordinary differential equations in practical engineering problems.
Course Code: 201HB103B	
Course Title: Engineering Chemistry	
CO1:	Understand the removal techniques of hardness of water
CO2:	Distinguish the fuel cells and batteries
CO3:	Identify different control techniques of corrosion
CO4:	Understand the concepts of plastics and rubbers
CO5:	Analyse the importance of nanomaterials.
Course Code: 201HB111B	
Course Title: Engineering Chemistry Laboratory	
CO1:	Explain the functioning of the instruments such as pH, conductivity, and potentiometric meters.
CO2:	Determine the total hardness of water
CO3:	Perform various redox titrations.
CO4:	Preparation of polymers
CO5:	Compare viscosities of different oils
Course outcomes for Second Year First Semester Course	
Course Code: 201HB301	
Course Title: Mathematics -III	
CO 1:	Apply the knowledge of Beta and Gamma function
CO 2:	Apply the knowledge of Laplace Transforms.
CO 3:	Evaluate Fourier series for different functions. Understand properties of Fourier transformation apply for different functions.
CO 4:	Solve first order partial differential equations
CO 5:	Solve high order partial differential equations with constant coefficients
Course Code: 201CE302	
Course Title: Strength of Materials	
CO 1:	Explain the basic materials behaviour under the influence of different external loading conditions and the support conditions
CO 2:	Draw the diagrams indicating the variation of the key performance features like bending moment and shear forces
CO 3:	Calculate the section modulus and determination of stresses developed in the beams due to various loading conditions
CO 4:	Assess stresses across the section of the thin and thick cylinders to arrive at optimum sections to withstand the internal pressure

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CO 5:	Determine the forces in beams subjected to distributed loads
Course Code: 201CE303	
Course Title: Fluid Mechanics	
CO 1:	Define various properties of fluids, state and explain different types of laws and principles of fluid mechanics
CO 2:	Apply Principles of mathematics to represent kinematic concepts related to fluid flow
CO 3:	Derive Euler's Equation of motion and Deduce Bernoulli's equation
CO 4:	Compute force of buoyancy on a partially or fully submerged body and analyse the stability of a floating body.
CO 5:	Measure velocity and rate of flow using various devices.
Course Code: 201CE304	
Course Title: Surveying and Geometrics	
CO 1:	Demonstrate the basic surveying skills
CO 2:	Use various surveying instruments.
CO 3:	Perform different methods of surveying
CO 4:	Compute various data required for various methods of surveying.
CO 5:	Develop the contour map
Course Code: 201CE305	
Course Title: Environmental Engineering	
CO 1:	Plan and design the water and distribution networks and sewerage systems.
CO 2:	Identify the water source and select proper intake structure.
CO 3:	Asses the water quality
CO 4:	Select the appropriate appurtenances in the water supply.
CO 5:	Select the suitable treatment flow for raw water treatments
Course Code: 201CE311	
Course Title: Material Testing Lab	
CO 1:	Determine the Engineering properties of materials in the laboratory.
CO 2:	Conduct laboratory tests to verify the suitability of the Engineering materials for the given purpose.
CO 3:	Verify the basic principles of behaviour of materials.
CO 4:	Verify the quality of materials through laboratory tests.
CO 5:	Use various materials testing Equipment.
Course Code: 201CE312	
Course Title: Building Planning and Drawing Lab	
CO 1:	Create, display, and plot working drawings
CO 2:	Construct drawings using layer techniques
CO 3:	Construct technical drawings using a standard computer aided drafting program
CO 4:	Evaluate modelling techniques such as edit, zoom, cross hatching, pattern filling, rotation,etc
CO 5:	Use the auto cad commands for drawing 2D building drawings required for different civil Engineering applications.
Course Code: 201CE313	
Course Title: Surveying Field Work (Lab)	
CO 1:	Apply the principle of surveying for civil Engineering Applications
CO 2:	Use techniques, skills and conventional surveying instruments necessary for Engineering practice.
CO 3:	Make use of the odolite to find heights and distances as well as conducting Trigonometric surveying
CO 4:	Use the Equipment Total station and its applications

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CO 5:	Calculate the areas, drawing plans and contour maps using different measuring Equipment at field level
Course Code: 201CE391	
Course Title: Constitution of India	
CO 1:	List out the fundamental Rights and Duties
CO 2:	Explain the Union Government and Administrative system
CO 3:	Explain the State Government and Administrative system
CO 4:	Explain the Local Administrative system
CO 5:	Write the role of Election commission
Course outcomes for Second Year Second Semester Course	
Course Code: 201HB401	
Course Title: Probability and Statistics	
CO 1:	Apply the knowledge of descriptive statistics and method of data science in practical engineering problems
CO 2:	Apply the knowledge of probability in practical engineering problems.
CO 3:	Demonstrate the knowledge of probability distribution
CO 4:	Enhance knowledge in Sampling & Estimation techniques.
CO 5:	Enhance knowledge in Design of Experiments.
Course Code: 201CE402	
Course Title: Mechanics of Materials	
CO 1:	Identify the basic concepts of Principal stresses, strains and various Theories of Failures.
CO 2:	Design the members for torsion, design the shafts and find the deflections of springs.
CO 3:	Find the stresses in columns and struts.
CO 4:	Calculate the Stresses under the combined action of direct loading and B.M and determinate the stresses in the case of chimneys, retaining walls and dams.
CO 5:	Evaluate forces in different types of trusses used in construction.
Course Code: 201CE403	
Course Title: Hydraulics and Hydraulic Machinery	
CO 1:	Solve problems in uniform, gradually and rapidly varied flows in open channel in steady State conditions.
CO 2:	Apply dimensional analysis and to differentiate the model, prototype and similitude Conditions for practical problems.
CO 3:	Calculate depth profiles in channels with steady gradually – varied flow.
CO 4:	Write the working principles of various hydraulic machineries.
CO 5:	Evaluate the different hydraulic machinery devices and its principles that will be utilized in Hydropower development and for other practical usages
Course Code: 201CE404	
Course Title: Concrete Technology	
CO 1:	Understand the basic concepts of concrete.
CO 2:	Realise the importance of quality of concrete.
CO 3:	Familiarise the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field.
CO 4:	Test the fresh concrete properties and the hardened concrete properties.
CO 5:	Evaluate the ingredients of concrete through lab test results.
Course Code: 201CE405	
Course Title: Managerial Economics and Financial Analysis	
CO 1:	Estimate the Demand and demand elasticity's for a product.
CO 2:	Understand the Input-Output-Cost relationships and estimation of the least cost combination of inputs.

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CO 3:	Understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
CO 4:	Prepare Financial Statements and the usage of various accounting tools for Analysis.
CO 5:	Evaluate various investment project proposals with the help of capital budgeting techniques for decision making.
Course Code: 201CE411	
Course Title: Environmental Engineering Lab	
CO 1:	Assess the quality of water and wastewater
CO 2:	Determine physical, chemical and biological characteristics of water and wastewater
CO 3:	Determine optimum dosage of coagulant
CO 4:	Determine break - point chlorination
CO 5:	Draw conclusions and decide whether the water is potable or not.
Course Code: 201CE412	
Course Title: Concrete Technology Lab	
CO 1:	Determine the consistency and fineness of cement.
CO 2:	Determine the setting times of cement.
CO 3:	Determine the specific gravity and soundness of cement.
CO 4:	Determine the compressive strength of cement.
CO 5:	Understand the non-destructive testing procedures on concrete.
CO 6:	Determine the specific gravity of coarse aggregate and fine aggregate by Sieve analysis
Course Code: 201CE413	
Course Title: Fluid Mechanics & Hydraulic Machinery Lab	
CO 1:	Calibrate various discharge measurement meters in an open channel flow.
CO 2:	Measure the discharge through an open channel.
CO 3:	Draw performance curves by conducting experiments on various hydraulic machines.
CO 4:	Conduct efficiency and performance tests on turbines and pumps.
CO 5:	Compare the results of analytical models and actual real flows
Course Code: 201HB481	
Course Title: English for Career (Skill oriented course-II)	
CO 1:	Understand the necessity to improve four language skills
CO 2:	Acquire knowledge about public speaking ability
CO 3:	Strengthen their grammatical skills in the language
CO 4:	Improve necessary vocabulary and academic writing skills
CO 5:	Improve academic wiring skills
Course outcomes for Third Year First Semester Course	
Course Code: 201CE501	
Course Title: Engineering Geology	
CO 1:	Identify and classify the geological minerals.
CO 2:	To Measure the rock strengths of various rocks.
CO 3:	Classify and measure the earthquake prone areas to practice the hazard donation.
CO 4:	Investigate the ground conditions through geophysical surveys.
CO 5:	Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc…
Course Code: 201CE502	
Course Title: Soil Mechanics	
CO 1:	To define various quantities related to soil mechanics and establish their interrelationships. To determine various index properties of the soils and classify the soils.

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CO 2:	To list down the importance of different engineering properties of the soil such as compaction, permeability
CO 3:	To calculate Stress Distribution In Soils
CO 4:	To list down the importance of consolidation and determine it
CO 5:	To list down the importance of shear strength and determine it
Course Code: 201CE503	
Course Title: Structural Analysis	
CO 1:	Differentiate the determinate and indeterminate structures.
CO 2:	Identify the behaviour of structures due to the expected loads, including the moving loads, acting on the structure
CO 3:	Estimate the bending moment and shear forces in beams for different boundary conditions.
CO 4:	Analyze the continuous beams using various methods-, three moment method, slope deflection method, energy theorems.
CO 5:	Draw the influence line diagrams for various types of moving loads on beams/bridges.
Course Code: 201CE564A	
Course Title: Construction Technology & Management	
CO 1:	evaluate the functioning of various earth moving equipment.
CO 2:	Explain the methods of production of aggregate products and concreting.
CO 3:	Apply the gained knowledge to project management and construction techniques.
CO 4:	Outline safety plans for demolition of buildings
CO 5:	Prepare fire safety plans for a given building
Course Code: 201CE511	
Course Title: Engineering Geology Lab	
CO 1:	Identify Mega-scopic minerals & their properties.
CO 2:	Identify Mega-scopic rocks & their properties.
CO 3:	Identify the site parameters such as contour, slope & aspect for topography.
CO 4:	Know the occurrence of materials using the strike & dip problems.
CO 5:	Know engineering geology in detail
Course Code: 201CE512	
Course Title: Soil Mechanics Lab	
CO 1:	Determine index properties of soil and classify them.
CO 2:	Determine permeability of soils
CO 3:	Determine Consolidation
CO 4:	Determine Compaction
CO 5:	Determine shear strength characteristics
Course Code: 201CE581	
Course Title: Software Applications in CIVIL ENGINEERING Lab (GIS, STAAD)	
CO 1:	Work comfortably on GIS software
CO 2:	Digitize and create thematic map and extract important features
CO 3:	Develop digital elevation model
CO 4:	Use structural analysis software to analyse and design 2D and 3D frames
CO 5:	Design and analyse retaining wall and simple towers using CADD software
Course outcomes for Third Year Second Semester Course	
Course Code: 201CE601	
Course Title: Hydrology, Irrigation & Water Resources Engineering.	
CO 1:	Estimate irrigation water requirements.
CO 2:	Design and Plan irrigation canals and canal network.

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CO 3:	Design irrigation canal structures.
CO 4:	Plan and design diversion head works.
CO 5:	Analyse stability of gravity and earth dams and Design ogee spillways and energy dissipation works.
Course Code: 201CE602	
Course Title: Theory of Structures	
CO 1:	Differentiate Determinate and Indeterminate Arch Structures
CO 2:	Carryout lateral Load analysis of structures
CO 3:	Analyse Cable and Suspension Bridge structures
CO 4:	Analyse structures using Kani's Method
CO 5:	Analyse structures using Matrix methods.
Course Code: 201CE603	
Course Title: Design of Reinforced Concrete Structures	
CO 1:	Carryout analysis and design of flexural members and detailing
CO 2:	Design structures subjected to shear, bond and torsion
CO 3:	Work on different types of design philosophies
CO 4:	Design different type of compression members
CO 5:	Design different type of Slabs and footings
Course Code: 201CE606	
Course Title: Transportation Engineering	
CO 1:	Plan highway network for a given area. Determine Highway alignment and design highway geometrics.
CO 2:	Judge suitability of pavement materials and design flexible and rigid pavements Construct highways
CO 3:	Design geometrics in a railway track
CO 4:	Design airport geometrics and airfield pavements
CO 5:	Plan, construct and maintain Docks and Harbours
Course Code: 201CE664B	
Course Title: Foundation Engineering	
CO 1:	Understand the various types of shallow foundations and decide on their location based on soil characteristics.
CO 2:	Compute the magnitude of foundation settlement and
CO 3:	Use the field test data and arrive at the bearing capacity.
CO 4:	Apply the principles of bearing capacity of piles and design them accordingly
CO 5:	To decide the size of the foundation
Course Code: 201CE611	
Course Title: Transportation Engineering Lab	
CO 1:	Determine the Aggregate Crushing value & Aggregate Impact strengths.
CO 2:	Determine the shape, specific gravity and Water Absorption values of road aggregates.
CO 3:	Determine the Abrasion & Attrition values of road aggregates.
CO 4:	Determine the penetration & ductility of bitumen.
CO 5:	Ability to test softening point, flash & fire point, stripping & viscosity of the given bitumen sample
CO 6:	Ability to perform marshal stability test of the given bituminous mix
Course Code: 201CE681	
Course Title: Design & Detailing Lab	
CO 1:	Design the Beams
CO 2:	Design the columns

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CO 3:	Design the Slabs
CO 4:	Design the Water Tank
CO 5:	Design the Retaining Wall
Course outcomes for Fourth Year First Semester Course	
Course Code:201CE761A	
Course Title: Estimation, Specification & Contracts	
CO 1:	Determine the quantities of different components of buildings.
CO 2:	Find the cost of various building components.
CO 3:	Capable of finalizing the value of structures.
Course Code:201CE762B	
Course Title: Ground Improvement Techniques	
CO 1:	Understand various methods of ground improvement and their suitability to different field situations.
CO 2:	Design a reinforced earth embankment and check its stability.
CO 3:	Know the various functions of Geo synthetics and their applications in Civil Engineering practice
CO 4:	Understand the concepts and applications of grouting.
CO 5:	Understand the Reinforced earth technology and soil nailing
Course Code:201CE763A	
Course Title: Design of Steel Structures	
CO 1:	Work with relevant IS codes
CO 2:	Carryout analysis and design of flexural members and detailing.
CO 3:	Design compression members of different types with connection detailing.
CO 4:	Design Plate Girder with connection detailing
CO 5:	Produce the drawings pertaining to different components of steel structures
Course Code:201CE761	
Course Title: Remote Sensing & GIS in Mining	
CO 1:	understand ground, air and satellite-based sensor platforms
CO 2:	Interpret the aerial photographs
CO 3:	Create and input spatial data for GIS application
CO 4:	Apply RS and GIS concepts in water resources engineering.
CO 5:	Interpret the satellite imageries

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GRBT-20 B.Tech Electrical & Electronic Engineering

Department Vision

To be a pioneering department in preparing students to compete globally in their profession and making significant contribution to the society.

Department Mission

- Establishing centres of excellence with focus on advanced technology
- By preparing the students for successful careers based on a strong normal ethicalfoundation
- Delivering world class teaching, mentoring, intellectual stimulation, industry collaborationsand state of the art research
- By training and educating students as global citizens to become entrepreneurs in theirchosen field

Program Educational Objectives (PEOs):

PEO 1	Engage in ongoing learning and professional development through self- study, continuing education in Electrical and Electronics Engineering and also in other allied fields
PEO 2	Apply their engineering skills, exhibiting critical thinking and problem solving skills in professional engineering practices or tackle social, technical andbusiness challenges
PEO 3	Improve professional competence through lifelong learning including higher education and research
Program Specific Outcomes (PSO's):	
PSO 1	Apply knowledge of power system configuration, electrical equipment and protection practices to the design and specifications of electrical generation, transmission, distribution and utilization systems
PSO 2	To design. Analyze, test and evaluate the performance of the electrical machines and transformers
PSO 3	To develop the expertise in the technology associated with efficient conversion and control of electrical power by static means from available forms to therequired form
PSO 4	Graduates will able to work as research fellow and implement their knowledge in all electrical and electronics research organization of defense, renewable energy,mines, chemical and power plants

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Program Outcomes (POs): Engineering Graduates will be able to:

1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problemsanddesignsystemcomponentsorprocessesthatmeetthespecifiedneedswithapprop riate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems: Use** research-based knowledge and research methods including design of experiments, analysis and interpretation of data andsynthesis of the information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, andmodern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledgeto assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate theknowledge of, and need for sustain able development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a memberor leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend andwrite effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and abilityto engage in independent and life-long learning in the broadest context of technological change.

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Course Outcomes for First Year First Semester Course	
Course Code: 201EE105	
Course Title: Electro Magnetic Fields	
CO-1	Analyse field potentials due to static changes and static magnetic fields
CO-2	Explain how materials affect electric and magnetic fields
CO-3	Analyse the relation between the fields under time varying situations.
CO-4	Discuss the principles of propagation of uniform plane waves.
CO-5	Justify the concepts of electromagnetic waves, mean of transporting energy or In formation .in the form of radio waves, TV signals, radar beams and light rays
Course Code: 201EE104	
Course Title: Basic electrical and electronics engineering	
CO-1	Analyze the various electrical networks
CO-2	understand the operation of DC machines 3-point starter and conduct the Swinburne's Test
CO-3	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
CO-4	Analyze the operation of half wave, full wave rectifier, op-amp.
CO-5	Explain the single stage CE amplifier and concept of feedback amplifier
Course Code: 201EE112	
Course Title: Basic electrical and electronics engineering lab	
CO-1	Analyze the various electrical networks
CO-2	understand the operation of DC machines 3-point starter and conduct the Swinburne's Test
CO-3	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
CO-4	Analyze the operation of half wave, full wave rectifier, op-amp.
CO-5	Explain the single stage CE amplifier and concept of feedback amplifier
Course Code: 201HB101	
Course Title: Mathematics-I	
CO-1	Transform the knowledge of solving system of linear equations using matrices
CO-2	Evaluate the nature of the quadratic form
CO-3	Acquire the knowledge of maxima and minima of function of several v variables
CO-4	Evaluate multiple integrals and their applications
CO-5	Understand and apply vector derivatives and vector integration theorem
Course Code: 201HB103b	
Course Title: Engineering Chemistry	
CO-1	Understand the removal technique of hardness of the water
CO-2	Distinguish the fuel cells and batteries
CO-3	Identify different control techniques of corrosion
CO-4	Understand the concept of plastics and rubbers
CO-5	Analyze the importance of nano materials
Course Code: 201HB102	
Course Title: Communicative English-I	
CO-1	Develop effective reading strategies
CO-2	Demonstrate writing skills that are required for professional development and use graphic elements for communication

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CO-3	Apply grammatical skills and vocabulary effectively in speech and writing
CO-4	Display language efficacy in tune with subjective knowledge
CO-5	Use required language along with contextual vocabulary and grammar structures
Course Code: 201HB111b	
Course Title: Engineering Chemistry Laboratory	
CO-1	Explain the functioning of the instruments such as pH, Conductivity and Potentiometric meters
CO-2	Determine the total hardness of the water
CO-3	Perform various Redox titrations
CO-4	Preparation of polymers
CO-5	Compare viscosities of different oils
Course Code: 201ME113b	
Course Title: Electrical Engineering Workshop	
CO-1	Explain the limitations, tolerances, safety aspects of electrical systems & wiring.
CO-2	Select wires/cables and other accessories used in different types of wiring
CO-3	Make simple lighting and power circuits
CO-4	Measure current, voltage and power in a circuit.
CO-5	Make disassembling and assembling of PC.
Course Outcomes for First Year Second Semester Course	
Course Code: 201HB201	
Course Title: Mathematics-II	
CO-1	Solve first order differential equations
CO-2	Solve higher order differential equations with constant coefficients
CO-3	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems
CO-4	Understand numerical differentiation and integration
CO-5	Apply the knowledge of different algorithms for approximating the solution of ordinary differential equations in practical engineering problems
Course Code: 201HB202a	
Course Title: Applied Physics	
CO-1	To impart knowledge of physical optical phenomenon like interference, diffractionand polarization
CO-2	To demonstrate the concept of absorption and emission
CO-3	To study the Schrodinger equation for standard systems by analytical and numericalmethods
CO-4	To classify the energy bands of semiconductors
Course Code: 201CS204a	
Course Title: Fundamentals of Computer Programming	
CO-1	Obtain the knowledge about different languages used in computer programming
CO-2	Write algorithm. Flow chart, and structure of C program and make use of different Ctokens
CO-3	Develop program by using control structure, different looping and Jump statements
CO-4	Implement applications of Array, structure and String inside the program
CO-5	Obtain the knowledge about accessing the memory in the program and also to developthe program by using different function types
Course Code: 201EE205a	
Course Title: Electrical Circuit Analysis	
CO-1	Analyze electrical network in presence of active and passive elements

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CO-2	Analyze magnetic circuit with various dot convention
CO-3	Analyze steady state circuits
CO-4	Analyze series and parallel resonant circuit
CO-5	Analyze electric circuits using Network Theorems
Course Code: 201ME203	
Course Title: Engineering Graphics	
CO-1	Apply principles of drawing to represent dimensions of an object
CO-2	Outline the Polygons and engineering curves
CO-3	Illustrate projections of points, lines, plane and solids
CO-4	Illustrate 3D views through isometric views
CO-5	Create the isometric views and orthographic views
Course Code: 201HB211a	
Course Title: Applied Physics Laboratory	
CO-1	To handle optical instruments like microscope and spectrometer
CO-2	To demonstrate the importance of dielectric material in storage of electric field energyin capacitors
CO-3	To evaluate the resistivity of the given semiconductor using probe method
CO-4	To identify the type of semi-conductor
Course code: 201CS213a	
Course Title: Fundamentals of Computer Programming Laboratory	
CO-1	Obtain the knowledge about different languages used in computer programming
CO-2	Write algorithm. Flow chart, and structure of C program and make use of different C tokens
CO-3	Develop program by using control structure, different looping and Jump statements
CO-4	Implement applications of Array, structure and String inside the program
CO-5	Obtain the knowledge about accessing the memory in the program and also to developthe program by using different function types
Course Code: 201HB212	
Course Title: Communicative English Laboratory	
CO-1	Learn to communicate in English
CO-2	Comprehend native speaker's accent
CO-3	Speak appropriately in real life situations
CO-4	Display public speaking skills in the required context
CO-5	Handle different communicative situations
Course code: 201HB296	
Course Title: Environmental science	
CO-1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems
CO-2	Comprehend environmental problems from multiple perspectives with emphasis on human modern life styles and developmental activities
CO-3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of 21st century
CO-4	Recognize the interconnectedness of human dependence on the earth's eco system
CO-5	Influence their society in proper utilization of goods and services

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Course Outcomes for Second Year First SemesterCourse	
Course Code: 201HB301	
Course Title: Mathematics – III	
CO-1	Familiarize with the techniques in partial differential equations and complex variables
CO-2	Solve application problems
CO-3	Familiarize the transform techniques and complex variables
Course Code: 201EE302	
Course Title: Fundamentals of Electronics Devices and circuits	
CO-1	Understand the basic concepts of semiconductor physics
CO-2	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
CO-3	Know the construction, working principle of rectifiers with and without filters withrelevant expressions and necessary comparisons
CO-4	Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configuration
CO-5	Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions
Course Code: 201EE303	
Course Title: Electrical Circuit Analysis –II	
CO-1	Understand the concepts of balanced and unbalanced three-phase circuits
CO-2	Know the transient behavior of electrical networks with DC excitations.
CO-3	Learn the transient behavior of electrical networks with AC excitations.
CO-4	Estimate various parameters of a two-port network.
CO-5	Understand the significance of filters in electrical networks
Course Code: 201EE304	
Course Title: DC Machines and Transformers	
CO-1	Assimilate the concepts of electromechanical energy conversion
CO-2	Mitigate the ill-effects of armature reaction and improve commutation in dc machines
CO-3	Understand the torque production mechanism and control the speed of dc motors
CO-4	Analyze the performance of single-phase transformers
CO-5	Predetermine regulation, losses and efficiency of single-phase transformers
Course Code: 201EE305	
Course Title: Electrical measurements	
CO-1	Know principles of different electrical measurement instruments and to measure voltage and current and different types of instruments for measurement of Power and Energy.
CO-2	Understand about different types of A.C and D. C Potentiometers
CO-3	Measure resistance, capacitance, inductance and frequency by using various bridges
CO-4	Know about the magnetic measurements
CO-5	Know about digital meters
Course Code: 201EE312	

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Course Title: Electrical Circuits Lab	
CO-1	Apply various theorems
CO-2	Determination of self and mutual inductances
CO-3	Two port parameters of a given electric circuits
CO-4	Draw locus diagrams
CO-5	Apply various theorems
Course Code: 201EE312	
Course Title: Electrical measurements and machines lab-I	
CO-1	Determine and predetermine the performance of DC machines and Transformers
CO-2	Control the speed of DC motor
CO-3	Obtain three phases to two phase transformation
CO-4	Predetermine the efficiency and regulation of transformers and assess their performance
CO-5	Calibrate LPF wattmeter and dynamometer wattmeter.
Course Code: 201EE313	
Course Title: Fundamentals of Electronics Devices and circuits Lab	
CO-1	Analyze the characteristics of diodes, transistors and other devices
CO-2	Design and implement the rectifier circuits, SCR and UJT in the hardware circuits
CO-3	Design the biasing and amplifiers of BJT and FET amplifiers
CO-4	Measure electrical quantities using CRO in the experimentation
CO-5	Understand the frequency response of amplifiers, measure frequency, phase of signals.
Course Code: 201EE381	
Course Title: Skill Oriented Course Design of Electrical Circuits Using Engineering Software Tools	
CO-1	write the MATLAB programs to simulate the electrical circuit problems
CO-2	simulate various circuits for electrical parameters
CO-3	simulate various wave form for determination of wave form parameters
CO-4	simulate RLC series and parallel resonance circuits for resonant parameters
CO-5	simulate self-inductance and mutual inductance circuits
Course Code: 201CE391	
Course Title: Constitution of India	
CO-1	List the fundamental rights and duties
CO-2	Explain the union Government and state Government
CO-3	Explain the State Government and Administrative system
CO-4	Explain the Local Administrative system
CO-5	Write the role of Election Commission
Course Outcomes for Second Year Second SemesterCourse	
Course Code: 201CS401	
Course Title: Introduction to Python Programming	
CO-1	Understand the basic data types in Python

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CO-2	Understand the use of control statements
CO-3	Implement various data structures and their operations
CO-4	Implement of functions and modules
CO-5	Understand the importance of class and object
Course Code: 201EC402	
Course Title: Digital Electronics	
CO-1	Classify different number systems and apply to generate various codes.
CO-2	Use the concept of Boolean algebra in minimization of switching functions
CO-3	Design different types of combinational logic circuits.
CO-4	Apply knowledge of flip-flops in designing of Registers and counters
CO-5	The operation and design methodology for synchronous sequential circuits and algorithmic state machines
Course Code: 201EE403	
Course Title: Power systems-1	
CO-1	Identify the different components of thermal power plants
CO-2	Identify the different components of nuclear Power plants
CO-3	Identify the different components of air and gas insulated substations.
CO-4	Identify single core and three core cables with different insulating materials
CO-5	Analyze the different economic factors of power generation and tariffs
Course Code: 201EE404	
Course Title: Induction and Synchronous Machines	
CO-1	Explain the operation and performance of three phase induction motor.
CO-2	Analyze the torque-speed relation, performance of induction motor and induction generator
CO-3	Implement the starting of single-phase induction motors
CO-4	Develop winding design and predetermine the regulation of synchronous generators
CO-5	Explain hunting phenomenon, implement methods of staring and correction of power factor with synchronous motor
Course Code: 201MB405	
Course Title: Managerial Economics & Financial Analysis	
CO-1	Estimate the Demand and demand elasticities for a product
CO-2	Understand the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
CO-3	Understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
CO-4	Prepare Financial Statements and the usage of various accounting tools for Analysis.
CO-5	Evaluate various investment project proposals with the help of capital budgeting techniques for decision making.
Course Code: 201CS411	
Course Title: Python Programming Lab	
CO-1	Write, Test and Debug Python programs
CO-2	Use conditions and Loops for Python programming

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CO-3	Use functions and represent Compound data using Lists
CO-4	Use Python classes in applications
CO-5	Implement various string operations
Course Code: 201EE412	
Course Title: Electrical measurements and machines lab-II	
CO-1	Assess the performance of single phase and three phase induction motors
CO-2	Control the speed of three phase induction motor
CO-3	Predetermine the regulation of three–phase alternator by various methods
CO-4	Find the Xd/Xq ratio of alternator and asses the performance of three–phase synchronousmotor
CO-5	Dielectric oil testing using H.T. testing Kit
Course Code: 201EC413	
Course Title: Digital Electronics Lab	
CO-1	Learn the basics of gates, filp-flops and counters
CO-2	Construct basic combinational circuits and verify their functionalities
CO-3	Apply the design procedures to design basic sequential circuits
CO-4	Understand the basic digital circuits and to verify their operation
CO-5	Design ripple counter and synchronous counter
Course Code: 201EE481	
Course Title: Skill oriented course –IoT Applications of Electrical Engineering	
CO-1	Apply various technologies of Internet of Things to real time applications
CO-2	Apply various communication technologies used in the Internet of Things.
CO-3	Connect the devices using web and internet in the iot environment.
CO-4	Implement iot to study Smart Home, Smart city, etc
CO-5	Apply concept of analog Input & Digital Output
Course Outcomes for Third Year First Semester Course	
Course Code: 201EE501	
Course Title : Control Systems	
CO-1	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
CO-2	Determine time response specifications of second order systems and to determine error constants
CO-3	Analyze absolute and relative stability of LTI system using Routh's and the root locus method
CO-4	Analyze the stability of LTI systems using frequency response methods
CO-5	Understand State space analysis of continuous systems
Course Code:201EE502	
Course Title: Power Systems-II	
CO-1	Understand the parameters of various types of transmission lines and to understand the performance of short, medium, long transmission lines
CO-2	Understand the effects of skin, proximity, Ferranti, corona effects on transmission lines

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CO-3	Understand the power system transients & sag, mechanical design of overhead lines and insulators
CO-4	Understand different methods of generation, distribution, control and compensation involved in the operation of power systems
CO-5	Understand Sag and Tension Calculations and Overhead Line Insulators
Course Code: 201EE503	
Course Title: Power Electronics	
CO-1	Demonstrate the characteristics of various power semiconductor devices
CO-2	Analyze different electrical parameters of single-phase AC-DC converters and semi converters for different loads and to evaluate the converters performance
CO-3	Analyze different DC-DC converters for different loads and to evaluate the converters performance.
CO-4	Understand inverters and application of PWM techniques
CO-5	Understand the working of AC-AC voltage regulators and cyclo converters
Course Code: 201EE504A	
Course Title: Special Electrical Machines	
CO-1	Explain theory of operation and control of switched reluctance motor
CO-2	Explain the performance and control of stepper motors, and their applications
CO-3	Describe the operation and characteristics of permanent magnet dc motor
CO-4	Understand the operation and characteristics of brush less dc motor.
CO-5	Understand the operation and characteristics of Linear motors
Course Code: 201EE504B	
Course Title: Electrical Distribution Systems	
CO-1	Understand the various factors of distribution system
CO-2	Design the substation and feeders.
CO-3	Determine the voltage drop and power loss
CO-4	Understand the operation of various protective and coordinating equipment
CO-5	Understand the compensation methods for Power Factor Improvement
Course Code: 201EE504C	
Course Title: High Voltage Engineering	
CO-1	Understand theory of breakdown and withstand phenomena of all types of dielectrics Materials.
CO-2	Acquaint with the techniques of generation of AC, DC and Impulse voltages
CO-3	Know the techniques of testing various equipment 's used in HV engineering
CO-4	Transient voltages and their propagation characteristics
CO-5	Know the various methods of high voltage testing on electrical apparatus
CourseCode:201EE504A	
Course Title: Digital Control Systems	

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CO-1	Learn the advantages of discrete time control systems and the khow how of various associated accessories
CO-2	Understand z transformations and their role in the mathematical analysis of different systems (like Laplace transforms in analogy systems).
CO-3	Learn stability criterion for digital systems and methods adopted for testing
CO-4	Understand the conventional and state space methods of design
CO-5	Design discrete time control systems by conventional methods
CourseCode:201EE508	
Course Title: Control systems laboratory	
CO-1	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs
CO-2	Determine time response specifications of second order systems and to determine error constants
CO-3	Analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method.
CO-4	Analyze the stability of LTI systems using frequency response methods
CO-5	Study about the Effect of controllers on second order systems
Course Code: 201EE509	
Course Title: Power electronics laboratory	
CO-1	Know the characteristics of various power electronic devices
CO-2	Analyze firing circuit and commutation circuits of SCR
CO-3	Analyze the performance of single phase and three phase full wave bridge converters, single phase dual converter with both resistive and inductive loads
CO-4	Understand the operation of AC voltage controller and cycloconverter with resistive and inductive loads
CO-5	Understand the working of Buck converter, Boost converter, single phase bridge inverter and PWM inverter.
Course Code: 201MB510	
Course Title: IPR and Patents	
CO-1	Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness.
CO-2	Analyze and evaluate various facility alternatives and their capacity decisions, develop a balanced line of production & scheduling and sequencing techniques in operationenvironments.
CO-3	Develop aggregate capacity plans and MPS in operation environment.
CO-4	Plan and implement suitable materials handling principles and practices in the operations.
CO-5	Plan and implement suitable quality control measures in Quality Circles to TQM.
Course Outcomes for Third Year Second Semester Course	
Course Code:201EE601	
Course Title: Switchgear and protection	
CO-1	Understand the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF6 gas type.
CO-2	Understand the working principle and constructional features of different types of electromagnetic protective relays

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CO-3	Knowledge of faults that is observed to occur in high power generator and transformers and protective schemes used for all protections
CO-4	Understand about static relays and various types of protective schemes used for feeders and bus bar protection
CO-5	Understand about over voltage protection
Course Code:201EE602	
Course Title: Power system analysis	
CO-1	Draw an impedance diagram and SLD for a power system network and form a Y bus matrix for a power system network with or without mutual couplings.
CO-2	Find out the load flow solution of a power system network using different types of load flow methods
CO-3	Formulate the Z bus for a power system network.
CO-4	Find out the fault currents for all types faults with a view to provide data for the design of protective devices
CO-5	Knowledge on Power System Stability Analysis
Course Code:201EE603	
Course Title: Microprocessors and Microcontrollers	
CO-1	Understand the operation of 8086 micro processor
CO-2	Do assembly language programming using 8086 processor
CO-3	Do interfacing design of peripherals like I/O, A/D, D/A, timer etc
CO-4	Develop systems using different microcontrollers
CO-5	learn hardware and software interaction and integration
Course Code:201EE604A	
Course Title: Power system operation and control	
CO-1	Compute optimal scheduling of Generators
CO-2	Understand hydrothermal scheduling
CO-3	Understand importance of the frequency
CO-4	Understand the automatic generation control and carry out a small signal analysis of multi area system
CO-5	Understand the concept of reactive power control
Course Code:201EE605	
Course Title: Power semiconductor drives	
CO-1	Know the fundamentals of electric drive and different electric braking methods
CO-2	Analyze the operation of three phase converter-controlled dc motors and four quadrants operation of dc motors using dual converters.
CO-3	Know the converter control of dc motors in various quadrants
CO-4	Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters
CO-5	Know the concept of Synchronous Motor Drives
Course Code:201EE604B	
Course Title: Flexible AC transmission systems	
CO-1	Learn the basics of power flow control in transmission lines by using FACTS controllers.

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CO-2	Explain the operation and control of voltage source converter
CO-3	Discuss compensation methods to improve stability and reduce power oscillations in the transmission lines
CO-4	Learn the method of shunt compensation by using static VAR compensators.
CO-5	Learn the method of series compensation by using Static series compensators
Course Code:201EE604C	
Course Title: Extra high voltage transmission	
CO-1	Gain knowledge on basic concepts of Extra-high voltage transmission
CO-2	Understand the concepts of Voltage Gradients of Conductors
CO-3	Gain knowledge on Corona effects and Radio Interference
CO-4	Understand the Basic Concepts of HVDC Transmission Systems
CO-5	Apply knowledge about harmonics and filters
CourseCode:201EE612	
Course Title: Optimization through electrical software	
CO-1	Develop an understanding of the software tools and their usage.
CO-2	Know various tools used for optimization
CO-3	Know the Estimation of energy resources and economics of power system
CO-4	Design various components used in power system using software
CO-5	Know the applications of the software tools studied
Course Code:201EE611	
Course Title: Microprocessors and Microcontrollers Laboratory	
CO-1	Do assembly language programming
CO-2	Do interfacing design of peripherals like I/O, A/D, D/A, timer etc
CO-3	Develop systems using different microcontrollers
CO-4	learn hardware and software interaction and integration
CO-5	Understand the use of external interrupts
CourseCode:201EE612	
Course Title: Electrical simulation laboratory	
CO-1	Simulate control systems & machine models
CO-2	Simulate transmission line with models
CO-3	Perform transient analysis of RLC circuit and single machine connected to infinite bus
CO-4	Simulate power electronic converters
CO-5	Simulate lossless transmission line
Course Code:201EE610	

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Course Title: Power systems laboratory	
CO-1	Understand the parameters of various types of transmission lines and to understand the performance of short, medium, long transmission lines.
CO-2	Understand the effects of skin, proximity, Ferranti, corona effects on transmission lines
CO-3	Understand about Load frequency controls
CO-4	Understand about the different types of faults identification in transformers and alternators
CO-5	Understand about Transient Stability Analysis
Course Outcomes for Fourth Year First SemesterCourse	
Course Code:201EE701A	
Course Title: Grid integration of renewable energy sources	
CO-1	Apply the control principles for PV - grid integration control
CO-2	Apply the control principles for wind power integration control
CO-3	Identify power quality challenges in grid integration of renewable energy
CO-4	Identify challenges in grid integration of multiple renewable sources
CO-5	Analyze the storage system for grid integration of multiple renewable sources
Course Code:201EE702B	
Course Title: Smart grid communication and cyber security	
CO-1	Understand the power quality management in smart grid communications
CO-2	Understand the communication technologies for smart grid
CO-3	Analyze the information security of smart grid and measurement technologies
CO-4	Understand the substation standards for communication
CO-5	Analyze the hacking and cyber security aspects in smart grids
Course Code:201EE702C	
Course Title: Solar PV and micro energy technologies	
CO-1	Interpret the principles and control of Solar PV Energy system
CO-2	Analyze the Solar PV energy system components
CO-3	Understand the Solar Photo Voltaic System Testing
CO-4	Understand the Energy and environment correlations
CO-5	Identify the micro-energy conversion technologies
Course Code:201EE701	
Course Title: Energy audit, conservation and management.	

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CO-1	Understand the current energy scenario and importance of energy conservation
CO-2	Understand the concepts of energy management
CO-3	Understand the Basics of Energy Audit
CO-4	Understand the methods of improving energy efficiency in different electrical systems
CO-5	Understand the concepts of different energy efficient devices.
Course Code: 201EE703A	
Course Title: Power quality	
CO-1	Understand the concepts of power quality and voltage imperfections in power systems and power factor improvement
CO-2	Know the concepts of harmonic distortion and distributed generation and power quality issues
CO-3	Know the power quality monitoring and instrumentation, applications of intelligence systems
CO-4	Proper assessment of power quality through different measurement techniques
CO-5	Understanding on power quality monitoring and Instrumentation
Course Code:201EE703B	
Course Title: Power system reforms	
CO-1	Identify various concepts of deregulation and restructuring of power sector
CO-2	Describe important concepts related with deregulation like market power and system operator of deregulated market.
CO-3	To know about the control strategy and management including OASIS, congestion management etc
CO-4	Apply principal to explain various problems related with deregulation of power sector
CO-5	Assess and capable of getting some knowledge about load forecasting and the results obtained by solving problems
Course Code: 201EE703C	
Course Title: Utilization of electrical energy	
CO-1	Identify most appropriate heating or welding techniques for suitable applications
CO-2	understand various level of luminosity produced by different illuminating sources
CO-3	Identify a suitable motor for electric drives and industrial applications
CO-4	Identify the various types of Industrial loads
CO-5	Understanding the concepts of Electric Traction
Course Code: 201EE704A	
Course Title: Programmable Logic Controllers and Applications	
CO-1	Gain knowledge on programmable logic controllers
CO-2	Understand various types of PLC registers
CO-3	Create ladder diagrams for process control

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CO-4	Use different types of data handling functions
CO-5	Understand analogy PLC operations
Course Code:201EE704B	
Course Title: Power Converters for Battery Charging	
CO-1	Understand different charger topologies
CO-2	Interpret Power electronic converters for electric vehicle charging
CO-3	Develop control algorithms for various electric vehicle charging modes
CO-4	Demonstrate charging station infrastructure
CO-5	Demonstrate installation of charging station
Course Code:201EE704C	
Course Title: Energy management systems and SCADA	
CO-1	Understand SCADA and its architecture
CO-2	Understand the application of SCADA in various utilities
CO-3	Apply the knowledge in analyzing various real time applications on transmission side
CO-4	Apply the knowledge in analyzing various real time applications on distribution side
CO-5	Apply the knowledge in analyzing various real time applications on load side.
Course Code:201EE705A	
Course Title: Switched mode power converters	
CO-1	Analyze the operation of DC-DC converters with current and voltage mode control
CO-2	Analyze resonant converters and their control techniques
CO-3	Understand the concepts of Converter Transfer Functions
CO-4	Design DC-DC converters and evaluate the stability of the system
CO-5	Design feedback loops for the power converters
Course Code:201EE705B	
Course Title: High voltage DC transmission	
CO-1	Understand the advantages of DC transmission over ac transmission.
CO-2	Understand the operation of Line Commutated Converters and Voltage SourceConverters
CO-3	Analyze the various components used in HVDC systems
CO-4	Understand the control strategies used in HVDC transmission system
CO-5	Understand the improvement of power system stability using an HVDC system
Course Code:201EE706	
Course Title: Simulation studies on electromagnetic transients' software	
CO-1	Understand the various equipment in a power system.

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CO-2	Understand the concept of Transmission Line and its Modeling
CO-3	Understand the concept of Transformer modeling
CO-4	Know about synchronous generators
CO-5	Know about switching Over-Voltages and Modeling of Surge Arresters
Course Outcomes for Fourth Year Second Semester Course	
Course Code:201EE811	
Course Title: Project work	
CO-1	Identify a current problem through literature/field/ case studies and define the background objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/process.
CO-3	Implement and evaluate the technology at the laboratory level.
CO-4	Write report and present it effectively.

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GRBT-20 B.Tech Mechanical Engineering

Department Vision: To be recognized as a Global Centre of Excellence in Mechanical Engineering Education, Research and Consultancy

Department Mission: Department of Mechanical Engineering strives to provide scope for all round development of the students and staff by engaging them in various activities such as

- Participative learning so that students internalize their classroom learning practices.
- Student centric learning practices such as summary sessions, learn-ahead-of class, problem solving.
- Extensive practical courses to foster learning by observation.
- Exposing students, faculty and staff to various industrial practices and usage of modern tools to reinforce their classroom/laboratory learning.
- Sensitization towards importance of ethical practice, societal responsibility, leadership skills, entrepreneurship skills, communication skills and lifelong learning.

Program Educational Objectives (PEOs):

PEO1	Working professional in Mechanical Engineering field or other disciplines to develop products, processes to solve Mechanical Engineering related or other problems for betterment of society.
PEO2	Pursuing further education to enrich their knowledge in Mechanical Engineering or other fields.
PEO3	Undertaking entrepreneurial ventures in Mechanical Engineering or other disciplines.

Program Specific Outcomes (PSO's):

PSO1	Join a technically sophisticated workforce as successful professionals in a wide range of mechanical engineering and related fields.
PSO2	Continuously improve and expand their technical and professional skills through formal means as well as through informal self-study.
PSO3	Pursue advanced degrees in engineering, business, or other professional fields.
PSO4	Advance themselves professionally and personally by accepting professional and social responsibilities and pursuing leadership roles.

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Program Outcomes (POs): Engineering Graduates will be able to:

1	Apply fundamental knowledge of Science, Mathematics and Engineering principles in solving problems related to Mechanical Engineering.
2	Apply principles of design engineering, thermal engineering, production engineering and industrial engineering to arrive at a physically meaningful analysis of engineering problems.

3	Present feasible designs for simple domestic and industrial Mechanical Engineering problems through drawings and other multimedia tools to meet desired needs.
4	Identify, formulate and solve Mechanical engineering problems through rigorous research methodology.
5	Use Drafting, Modeling and Analysis Software and/or hardware tools for meaningful and economically viable Engineering practice.
6	Apply knowledge of Thermal, Design, Automation Technologies and Management principles to inter-disciplinary engineering problems and their societal implications.
7	Understand and propose, where ever possible, environment-friendly and sustainable solutions to Mechanical Engineering problems.
8	Expertise in following ethical code of conduct in professional activities.
9	Use their analytical, teamwork, leadership skills in the development of products and provide solutions to problems sought by local and/or global community.
10	Communicate verbally, textually and graphically to collaborate effectively towards engineering activities
11	Inspire confidence in team members to realize the goals of the organization and manage finances an sizeable projects by choosing the right blend of common sense solutions.
12	Develop confidence and a sense of curiosity towards life-long learning to adapt to ever changing technologies.

Course outcomes for First Year First SemesterCourse	
Course Code:201HB101	
Course Title: Mathematics - I	
CO1:	Transform the knowledge of solving system of linear equations using matrices.
CO2:	Evaluate nature of the Quadratic form.
CO3:	Acquire the knowledge maxima and minima of function of several variables.
CO4:	Evaluate multiple integrals and their applications.
CO5:	Understand and apply vector derivatives and vector integration theorems.
Course Code: 201HB102	
Course Title: Communicative English-I	
CO1:	Develop effective reading strategies
CO2:	Demonstrate writing skills that are required for professional development and use graphic elements for communication.
CO3:	Apply grammatical skills and vocabulary effectively in speech and writing
CO4:	Display language efficacy in tune with subjective knowledge
CO5:	Use required language along with contextual vocabulary and grammar structures
Course Code: 201HB103b	
Course Title: Engineering Chemistry	

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CO1:	Understand the removal techniques of hardness of water
CO2:	Distinguish the fuel cells and batteries
CO3:	Identify different control techniques of corrosion
CO4:	Understand the concepts of plastics and rubbers
CO5:	Analyse the importance of nanomaterials.
Course Code:201EE104	
Course Title: Basic Electrical and Electronics Engineering	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation of DC machines,3-point starter and conduct the Swinburne's Test.
CO3:	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
O4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.
Course Code: 201ME105	
Course Title:Engineering Graphics	
CO1:	Apply principles of drawing to represent dimensions of an object.
CO2:	Outline the polygons and engineering curves.
CO3:	Illustrate projections of points, lines, planes and solids.
CO4:	Illustrate the 3D views through isometric views.
CO5:	Create the isometric views and orthographic views
Course Code: 201HB111b	
Course Title: Engineering Chemistry Laboratory	
CO1:	Explain the functioning of the instruments such as pH, conductivity, and potentiometric meters.
CO2:	Determine the total hardness of water
CO3:	Perform various redox titrations.
CO4:	Preparation of polymers
CO5:	Compare viscosities of different oils
Course Code: 201EE112	
Course Title:Basic Electrical and Electronics Engineering Laboratory	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation or DC machines,3 -point starter and conduct the Swinburne's Test.
CO3:	Analyze the performance oi transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.
Course Code:201ME113d	
Course Title:Basic Engineering Workshop	
CO1:	Experiment with various basic housewiring techniques.
CO2:	Develop basic prototype in the trade of tin smithy such as square tray and openscoop.
CO3:	Design v-fitting and square fitting in the trade of fitting
CO4:	Making square rod and L-bend from the round rod in blacksmithy

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CO5:	Build various prototype like T lap joint, dovetail joint, cross lap etc. in the trade of carpentry.
Course outcomes for First Year Second Semester Course	
Course Code:201HB201	
Course Title: Mathematics – II	
CO1:	Solve first order differential equations.
CO2:	Solve higher order differential equations with constant coefficients
CO3:	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems.
CO4:	Understand numerical differentiation and integration.
CO5:	Apply the knowledge of different algorithms for approximating the solution of ordinary differential equations in practical engineering problems.
Course Code:201HB202b	
Course Title: Engineering Physics	
CO1:	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution. To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics
CO2:	To assess the electromagnetic wave propagation in different media and its power and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors.
CO3:	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.
CO4:	To interpret dielectric loss, Lorentz field and Claussius - Mosotti relation and classify the magnetic materials based on susceptibility and their temperature dependence. To apply the Gauss' Theorem for divergence and Stokes' theorem for curl and evaluate Maxwell's displacement current and correction in Ampere's law.
Course Code: 201ME203a	
Course Title: Engineering Mechanics	
CO1:	Carry out composition of system of forces.
CO2:	Analyse rigid bodies in static equilibrium condition under system of forces including friction.
CO3:	Determine centre of gravity and moment of inertia of simple and composite planar, solid sections.
CO4:	Carry out dynamic analysis of rigid bodies under translation, rotation and plane motion.
CO5:	Apply work energy and impulse momentum principles to rigid body motion.
Course Code:201CS204a	
Course Title: Fundamentals of Computer Programming	
CO1:	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO2:	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO3:	Develop program by using Control structure, different looping and Jump statement.
CO4:	Implement applications of Array, Structure and String inside the program.
CO5:	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.

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Course Outcomes for Second Year First Semester Course	
Course Code:201ME205	
Course Title: Material Science and Metallurgy	
CO1:	Demonstrate the knowledge of science and fundamentals of materials.
CO2:	Describe the regions of stability of phases that occur in the alloy systems.
CO3:	Classify steels and cast Irons with applications.
CO4:	Select heat treatment methods and non-ferrous materials.
CO5:	Explain the concept of ceramics and composites.
Course Code:201HB211b	
Course Title: Engineering Physics Laboratory	
CO1:	To handle optical instruments like microscope and spectrometer, determine thicknessof a hair/paper with the concept of interference and to estimate the wavelength andresolving power of different colors using diffraction grating
CO2:	To demonstrate the importance of dielectric material in storage of electric field energy in the capacitors and plot the intensity of the magnetic field of circular coilcarrying current with varying distance
CO3:	To evaluate the acceleration due to gravity using compound pendulum
CO4:	To determine the moment of inertia using Fly wheel
Course Code:201HB212	
Course Title: Communicative English Laboratory	
CO1:	Learn to communicate in English
CO2:	Comprehend native speaker's accent
CO3:	Speak appropriately in real life situations
CO4:	Display public speaking skills in the required context
CO5:	Handle different communicative situations
Course Code:201CS213a	
Course Title: Fundamentals of Computer Programming Laboratory	
CO1:	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO2:	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO3:	Develop program by using Control structure, different looping and Jump statement.
CO4:	Implement applications of Array, Structure and String inside the program.
CO5:	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.
Course Code:201HB296	
Course Title: Environmental Studies	
CO1:	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO2:	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO3:	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO4:	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO5:	Influence their society in proper utilization of goods and services

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GR-20 B.Tech Electronics & Communication Engineering

Department Vision:

Create an educational environment to mound the students to meet the challenges of modern Electronics & Communication industry through state of the art Technical knowledge and Innovative experimental Approaches.

Department Mission:

1. To create learning,development and testing environment to meet ever challenging needs of the Electronic industry
2. To create entrepreneurial environment and industry Interaction for Mutual benefit
3. To be come a global partner in training human resources in the fields of chip design, instrumentation and networking
4. To associate with internationally reputed Institutions for Academic excellence and collaborative Research

Program Educational Objectives (PEOs) :

PEO1	To prepare students with excellent comprehension of basic Sciences, mathematics and engineering subjects facilitating them to gain employment or pursue postgraduate studies with an appreciation for lifelong learning.
PEO2	To train students with problem solving capabilities such as analysis and design with adequate practical skills wherein they demonstrate creativity and innovation that would enable them to develop state of the art equipment and technologies of multidisciplinary nature for societal development.

Program Specific Outcomes (PSO's):

PSO1	Analyze and design analog and digital circuits or systems for a given specification and function.
PSO2	Implement functional blocks of hardware-software co-designs for signal processing and communication applications.

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Program Outcomes (POs): Engineering Graduates will be able to:

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

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Course outcomes (Cos) of all courses of all programs offered by the institution

Course Outcomes for First Year First Semester Course	
Course Code: 201HB101	
Course Title: Mathematics-I	
CO-1	Transform the knowledge of solving system of linear equations using matrices.
CO-2	Apply mean value Rolls, Laganges and Cauchy mean value theorem in engineering applications.
CO-3	Acquire the knowledge maxima and minima of function of several variables.
CO-4	Evaluate multiple integrals and their applications
Course Code: 201HB102	
CourseTitle:Communicative English-I	
CO-1	students will be able to develop effective reading strategies
CO-2	will be able to demonstrate writing skills that are required for professional development and use graphic elements for communication
CO-3	will be able to apply grammatical skills and vocabulary effectively in speech and writing
Course code: 201CS104	
Course Title: Engineering Physics	
CO-1	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution
CO-2	To interpret dielectric loss, Lorentz field and Claussius- Mosotti relation and classify the magnetic materials based on susceptibility and their temperature dependence.To apply the Gauss'
CO-3	To assess the electromagnetic wave propagation in different media and its power and explain the working principle of optical fibers and its classification based on refractive index profile and mode
CO-4	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.
Course Outcomes for First Year Second Semester Course	
Course code:201HB201	
Course Title: Mathematics-II	
CO-1	Apply the knowledge of descriptive statistics and method of data science in practical engineering problems.
CO-2	Apply the Knowledge of Probability in practical Engineering problems.
CO-3	Demonstrate the knowledge of Probability distributions.
CO-4	Enhance knowledge in Sampling & Estimation techniques.
Course code: 201ME203	
Course Title: Engineering Chemistry	
CO-1	Compare different types of cells
CO-2	Explain the merits of fuel cells
CO-3	List various sources of renewable energy
CO-4	Distinguish between polymers and plastics
CO-5	Distinguish between nano clusters &nanowires, polymers
Course code: 201CS204b	
Course Name : Basic Electrical & Electronics Engineering	
CO-1	Analyze the various electrical networks

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C0-2	Understand the operation of DC machines,3-point starter and conduct the Swinburne's Test.
Course Outcomes for Second Year First Semester Course	
Course Code: 201EC304	
Course Title: Electronic Devices and Circuits	
CO-1	Understand the characteristics of various electronic components.
CO-2	Know the construction, working principle of rectifiers with and without filters
CO-3	Understand the utilization of components.
CO-4	Gain knowledge of small signal low frequency transistor amplifier models
Course Code: 201EC305	
Course Title : Network Analysis	
CO-1	Analyze the basic concepts of circuits and different models of laws
CO-2	Apply the outputs of different elements in complex RLC circuits and get the response
CO-3	Apply the rules of different dot notation and solve the coupled network output, understand the concept of resonance and hence design the circuits under resonance.
Course code:201EC305	
CourseTitle: Signals and Systems	
CO-1	Differentiate the various classifications of signals and systems.
CO-2	Analyze the frequency domain representation of signals using Fourier concepts.
CO-3	Analyze the Convolution and Correlation with respect to LTI systems.
CO-4	Apply z-transforms to analyze signals and Systems.
Course Outcomes for Second Year Second Semester Course	
Course code : 201EC401	
CourseTitle : Electronic Circuit Analysis	
CO-1	Knowledge on both single and multistage amplifiers, design and analysis of multi stage amplifiers using BJT and FET.
CO-2	Analysis of small signal low and high frequency transistor amplifier circuits using BJT and FET.
CO-3	The expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
CO-4	Analysis of Tuned amplifiers with performance comparison.
Course Code: 201EC402	
Course Title : Analog Communications	
CO-1	Explain the concept of communication systems, and analyze the mathematical expressions for AM modulation and demodulation.
CO-2	Relate the different modulation and demodulation techniques and analyze the noise calculations.
CO-3	Analyze generation and detection of FM signals in both time and frequency domains and its noise calculations.
Course Code: 201EC403	

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Course Title Random Variable and Stochastic Process	
CO-1	Understand probabilities and able to solve using an appropriate sample space.
CO-2	Compute various operations like expectations from probability density functions (pdfs) and probability distribution functions
CO-3	Perform Likelihood ratio tests from pdf for statistical engineering problems.
C0-4	Mean and covariance functions for simple random variables.
Course Outcomes for Third Year First Semester Course	
Coursecode:201EC501	
CourseTitle:Linear& Digital IC Applications	
CO-1	Understand the internal operation of Op-Amp and its specifications.
CO-2	Analyze and design linear and nonlinear applications using Op-Amp.
CO-3	Operate 555 timers in different modes like biteable, constable and actable operations and study their applications.
CO-4	Understand the conversion process of ADC and DAC in digital electronics.
CO-5	Explain the differences between CMOS and TTL logic families and study various digital ICs.
Course code: 201EC502	
Course Title: Digital Communication	
CO-1	Analyze the performance of Digital communication system for probability of error and are able to design a digital communication system.
CO-2	Analyze various source coding techniques.
CO-3	Compute and analyze block codes, cyclic codes and convolution codes.
CO-4	Design a coded communication system.
Course Code: 201EC503	
Course Title : Antenna and Wave Propagation	
CO-1	Acquire knowledge of basic antenna parameters.
CO-2	Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas, and micro-strip antennas.
CO-3	Analyze the fields radiated by various types of antennas.
CO-4	Analyze antenna arrays.
Course Outcomes for Third Year Second Semester Course	
Course Code:201EC601	
Course Title : Microprocessors and Microcontrollers	
CO-1	Understand architectural difference between Microprocessor and Microcontroller and its need for development of products and product development procedure.
CO-2	Apply concepts of programming in Assembly Language.
CO-3	Apply the concepts of programming in Embedded C
C0-4	Analyse concepts of Input/output port Interfacing of microcontroller
CO-5	Apply concepts of Interfacing of various devices and sensors and importance through Embedded System.

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Course code : 201EC602	
Course Title : Digital signal processing	
CO-1	Estimate the spectra of signals that are to be processed by a discrete time filter, and to verify the performance of variety of modern and classical spectrum estimation techniques.
CO-2	Design and simulate a digital filter.
CO-3	Design new digital signal processing systems.
CO-4	Design and realize IIR filters.
Course code:201EC664D	
Course Title :VLSI Design	
CO-1	Apply the concept of design rules during the layout of a circuit.
CO-2	Model and simulate digital VLSI systems using Hardware Description Language.
CO-3	Synthesize digital VLSI systems from register transfer or higher level descriptions.
CO-4	Implement circuit through various design styles (semi Custom, Full Custom)
Course Outcomes for Fourth Year first Semester Course	
Course Code : 201EC681	
Course Title: Real time operating systems	
CO-1	Summarize the issues in real time computing
CO-2	Understand how RTOS utilize resources like memory,CPUetc effectively.
CO-3	Solve scheduling problems and can apply them in real time applications in industry
C0-4	Understand concepts of Exceptions, Interrupts,Timers
CO-5	Understand different Types of RTOS
Course code : 201EC761A	
Course Title : Wireless Sensor Networks	
CO-1	Analyse basics of system architecture and processor architecture.
CO-2	Design different types network topology in wireless ad-hoc networks
CO-3	Describe the design constraints of ad-hoc wireless sensor network
CO-4	Differentiate the various platforms and tools for WSN.

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Course code : 201EC762C	
Course Title : Digital Signal Processors and Architecture	
CO-1	Comprehend the concepts of Digital signal processing techniques.
CO-2	Design DSP computational building blocks to achieve high speed in DSP processor
CO-3	Comprehend DSP TMS320C54XX architecture and instructions.
C0-4	Implement basics DSP algorithms using DSP processor
CO-5	Interface memory, I/O peripherals and Serial communication devices to DSP processor
Course code : 201EC763C	
Course Title : Computer Networks	
CO-1	Analyze a communication system by separating out the different functions provided by the network; and some example networks
CO-2	Understand various network topologies required for communications
CO-3	Understand that there are fundamental limits to any communications systems
CO-4	Understand the general principles behind addressing routing, reliable transmission and other stateful protocols as well as specific examples of each
CO-5	Have an informed view of both internal workings of the Internet and of number of common internet
Course code: 201EC841	
Course Title : Project	
CO-1	Apply all levels of Engineering knowledge in solving the engineering problems.
CO-2	Work together with team spirit.
CO-3	Use civil engineering software at least once
CO-4	Document the projects.

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GRBT-20 B.Tech Computer Science & Engineering

Department Vision:

To be a centre of academic excellence in the field of computer science and engineering education and research, to serve as a valuable resource for industry and society, maintaining the traditions and human values.

Department Mission:

M1: Providing the best educational facilities for training students for the careers in science and technology.

M2: Providing a creative atmosphere in which higher studies and research thrive both among the students and the faculty.

M3: Undertaking collaborative projects which offer opportunities for long-term interaction with academia and industry.

M4: Sensitization towards importance for ethical practice, societal responsibility, leadership, entrepreneurship, communication and lifelong learning.

Program Educational Objectives(PEOs):

PEO1	Applying the fundamentals of mathematical, scientific and engineering knowledge and skill for a successful career and/or
PEO2	Pursuing higher education and partaking in research activities and/or
PEO3	Undertaking entrepreneurship and leadership role to meet the needs of the society.

Program Specific Outcomes(PSO's):

PSO1	Applying knowledge of engineering practices and ethical policies in development and maintenance of software and hardware solutions for real-time problems
PSO2	Ability to pursue higher education and research.

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Program Outcomes (POs) : Engineering Graduates will be able to:

1	**Engineering knowledge:** Apply knowledge of mathematics, science and engineering principles in solving problems related Computer Science and Engineering.
2	**Problem analysis:** Investigate, analyze and conduct experiments to establish cause and effect relationships.
3	**Design/development of solutions:** Demonstrate the abilities to design and develop algorithms and implement them to optimize the solution.
4	**Conduct investigations of complex problems:** Address the challenges of complex and computation-based problems to create innovative computing methods.
5	**Modern tool usage:** Adopt modern engineering tools or software's for analyzing and solving various computer science engineering problems.
6	**The engineer and society:** Understand the impact of social, cultural, ethical and global aspects in their professional practice.
7	**Environment and sustainability:** Understand the impact of professional engineering solutions for environmental sustainability.
8	**Ethics:** Exercise professional and ethical discretion.
9	**Individual and teamwork:** Visualize and work independently and in teams.
10	**Communication:** Communicate effectively.
11	**Project management and finance:** Employ knowledge of contemporary issues to various software engineering approaches for project management.
12	**Life-long learning:** Engage in lifelong learning

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Course Outcomes for First Year First Semester	
Course Code: 201HB101	
Course Title: MATHEMATICS-1	
CO-1	Translate the arguments using propositions and predicates to verify their validity.
CO-2	Utilize Boolean expressions and their simplifications.
CO-3	Make use of sets & relations in different functioning procedures.
CO-4	Illustrate the properties of Groups, Rings, Fields.
CO-5	Solve different counting problems and recurrence relations.
CO-6	Apply graph theory techniques to solve some problems related to computer science.
Course Code: 201HB102	
Course Title: COMMUNICATIVE ENGLISH	
CO-1	Understand the concepts of data science and their applications.
CO-2	Make use of the concepts of probability and their applications.
CO-3	Understand the concepts of Expectations and Moment generating function .Apply discrete probability distributions.
CO-4	Predict the discrete distribution suitable for the given data from its moments.
CO-5	Predict the continuous distribution suitable for the given data from its moments
CO-6	Understand the concepts of calculus and application of double integral.
Course Code :201HB103a	
Course Title: APPLIED PHYSICS	
CO-1	Use the fundamentals of oscillatory systems and the analogy of mechanical and electrical systems.
CO-2	Use interference, diffraction and polarization in optical systems
CO-3	Apply the fundamentals of quantum mechanics, crystallography and solid-state physics.
CO-4	Describe the working of a few commonly used lasers.

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CO-5	Classify optical fibers and describe their applications.
CO-6	Use the three laws of the rmo dynamics and apply them to a heat engine.
Course Code: 201CS104	
Course Title: PROBLEM SOLVING & PROGRAMMING IN C	
CO-1	Develop the algorithms, Programs and draw flowcharts for solving Mathematical and Engineering problems using basic elements like variables, operators and expressions.
CO-2	Utilize control statements, Functions to develop structured and unstructured programs and apply code reusability with user defined functions.
CO-3	Develop programs using arrays and pointers to implement static and dynamic memory allocation.
CO-4	Design, implement, test and debug programs that use Structures and I/O operations.
CO-5	Develop C programs for simple applications using files.
Course Code: 201CS105	
Course Title: FUNDAMENTALS OF DIGITAL ELECTRONICS	
CO-1	Apply Mesh and Nodal analysis to solve the circuits and conduct experiments to verify Ohm's law and Kirchhoff's laws for electrical circuits.
CO-2	Apply Network theorems and transformation techniques to solve DC circuits and conduct experiments to verify Network theorems for given electrical circuits.
CO-3	Calculate form factor, peak factor and determine power in AC circuits and conduct experiment to measure the power in AC circuit and determine the parameters of iron core inductor.
CO-4	Apply the concepts of electro statics and electro magnetism to understand the operation of capacitor and transformer and conduct the experiment to determine the performance of single phase transformer.
CO-5	Understand and apply electrical safety measures while handling electrical equipment.
Course Code: 201HB196	
Course Title: ENVIRONMENTAL SCIENCE	
CO-1	Recognize the need for life skills and values.
CO-2	Recognize own strengths and opportunities.
CO-3	Apply the life skills to different situations.
CO-4	Understand the basic tenets of communication.
CO-5	Apply the basic communication practices in different types of communication.
Course Code: 201HB111a	
Course Title: APPLIED PHYSICS LABORATORY	
CO-1	Describe the various procedures and techniques for the experiments.
CO-2	Develop design/ problem solving skills, practical experience through laboratory assignments which provide opportunities for developing team in multi-disciplinary environments.
CO-3	Recognize and describe to test the optical components using principles of interference, diffraction, laser & optical fiber parameters.
CO-4	Apply the analytical techniques and graphical analysis to the experimental data.

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Course Code: 201HB111a	
Course Title: APPLIED PHYSICS LABORATORY	
CO-1	Describe the various procedures and techniques for the experiments.
CO-2	Develop design/ problem solving skills, practical experience through laboratory assignments which provide opportunities for developing team in multi-disciplinary environments.
CO-3	Recognize and describe to test the optical components using principles of interference, diffraction, laser & optical fiber parameters.
CO-4	Apply the analytical techniques and graphical analysis to the experimental data.
Course Code: 201CS112	
Course Title: PROBLEM SOLVING & PROGRAMMING IN CLAB	
CO-1	Design the algorithms and draw flowcharts for the given mathematical and engineering problems.
CO-2	Write computer programs for the given algorithm.
CO-3	Design programs with the relevant control structure and parameter passing using functions and derived data types.
CO-4	Create and use header files and C pre-process or directive as utility.
CO-5	Use pattern searching and parsing strategies in problem solving.
Course Code: 201ME113c	
Course Title: COMPUTER ENGINEERING WORKSHOP	
CO-1	Assemble and disassemble components of a PC
CO-2	Construct a fully functional virtual machine, Summarize various Linux operating system commands
CO-3	Recognize characters & extract text from scanned images, Create audio files and podcasts

Course Outcomes for First Year Second Semester	
Course Code: 201HB201	
Course Title: MATHEMATICS-II	
CO-1	Solve first order differential equations.
CO-2	Solve higher order differential equations with constant coefficients.
CO-3	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems.
CO-4	Understand numerical differentiation and integration.
CO-5	Apply the Knowledge of different algorithms for approximating the solution of ordinary differential equations in practical Engineering problems.
Course Code: 201HB202	
Course Title: ENGINEERING CHEMISTRY	

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CO-1	Understand the removal techniques of hardness of water
CO-2	Distinguish the fuel cells and batteries
CO-3	Identify different control techniques of corrosion
CO-4	Understand the concepts of plastics and rubbers
CO-5	Analyze the importance of nano materials
Course Code: 201ME203	
Course Title: ENGINEERING GRAPHICS	
CO-1	Apply principles of drawing to represent dimensions of an object.
CO-2	Outline the polygons and engineering curves.
CO-3	Illustrate projections of points, lines, planes and solids.
CO-4	Illustrate the 3D views through isometric views.
CO-5	Create the isometric views and orthographic views
Course Code: 201CS204	
Course Title: DATA STRUCTURES	
CO-1	To be able to choose appropriate data structure as applied to specified problem definition.
CO-2	To be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures
CO-3	To be able to apply concepts learned in various domains like DBMS, compiler construction.
CO-4	To be able to use linear and non-linear data structures like stacks, queues, linked list etc.
Course Code: 201CS205	
Course Title: PYTHON PROGRAMMING	
CO-1	Handle different data structures.
CO-2	understand the use of control statements, function overloading, operator overloading in real time application
CO-3	Implement files using various file operations.
Course Code: 201HB211	
Course Title: ENGINEERING CHEMISTRY LAB	
CO-1	Explain the functioning of the instruments such as pH, Conductivity and Potentiometric meters
CO-2	Determine the total hardness of water
CO-3	Perform various Redox titrations
CO-4	Preparation of polymers
CO-5	Compare viscosities of different oils

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Course Code: 201HB212	
Course Title: COMMUNICATIVE ENGLISHLAB	
CO-1	Learn to communicate in English
CO-2	Comprehend native speaker's accent.
CO-3	Speak appropriately in real life situations
Course Code: 201CS213	
Course Title: DATA STRUCTURES LAB	
CO-1	Write the programs for mathematical functions using python programming language.
CO 2	Write programs for object-oriented concepts and data structures.
CO-3	Choose appropriate data structure as applied to specified problem definition.
CO-4	Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
CO-5	Apply concepts learned in various domains like DBMS, compiler construction etc.
CO-6	Use linear and non-linear data structures like stacks, queues, linked list etc.

Course Outcomes for Second Year Third Semester	
Course Code: 201CS301	
Course Title: Mathematical Foundations of Computer Science	
CO-1	Understand the Logic Sets and Functions.
CO-2	Use mathematical reasoning techniques including induction and recursion
CO-3	Construct mathematical arguments using logical connectives and quantifiers.
CO-4	Verify the correctness of an argument using propositional and predicate logic and truth tables.
CO-5	Apply basic and advanced principles of counting
Course Code: 201CS303	
Course Title: Computer Organization	
CO-1	Represent the data in various formats
CO-2	Perform various register operations
CO-3	Organize and design a computer system
CO-4	Perform logic operations and operations on microprocessors
CO-5	Analyze the performance of commercially available computers.

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Course Code: 201CS305	
Course Title: Object Oriented Programming through JAVA	
CO-1	Learn the structure of Java Program and its applications
CO-2	Develop a software/application using Java Programming language
CO-3	Synthesize the give problem and implement it in Java
CO-4	Choose an engineering approach to solve problems using Java
CO-5	Develop interactive programs using applets.
Course Code: 201HB205	
Course Title: Managerial Economics and Financial Analysis	
CO-1	Evaluate the economic theories, cost concepts and pricing policies
CO-2	Understand the market structures and integration concepts
CO-3	Understand accounting systems and analyze financial statements using ratio analysis
CO-4	Understand the measures of national income, the functions of banks and concepts of Globalization
CO-5	Apply the concepts of financial management for project appraisal
Course Code: 201CS311	
Course Title: Data Analysis Lab	
CO-1	Perform various operations on Data using built-in tools.
CO-2	Organize and analysis the data using Built-in Tools.
CO-3	Apply filters, charts and pivot tables on data from a .csv file.
CO-4	Work on worksheets and workbooks.
CO-5	Work on external data and crating relationships with other workbooks
Course Code: 201CS312	
Course Title: Object Oriented Programming through JAVA Lab	
CO-1	Write programs for solving real world problems using java collection frame
CO-2	Write programs using abstract classes
CO-3	Write multithreaded programs
CO-4	Write GUI programs using event handling in Java
CO-5	Write programs using applet

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Course Code: 201CS313	
Course Title: Linux and Shell Programming Lab	
CO-1	Ability to understand the Linux environment.
CO 2	Understand the basic command of Linux operating systems and write shell scripts
CO-3	Ability to perform the file management and multiple tasks using shell
CO-4	Write programs on important Linux library functions and system calls.
CO-5	Apply administrative functions on Linux operating system

Course Code: 201CS381	
Course Title: Web Application Development Using Full Stack Module -1	
CO-1	Analyze a webpage and identify its elements and attributes.
CO 2	Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Stylesheet
CO-3	Implement MVC and responsive design to scale well across PC,Tablet and Mobile Phone
CO-4	Create WebPages using HTML and Cascading Style Sheets.
CO-5	Develop websites with HTML and CSS
Course Code: 201CE391	
Course Title: Constitution of India	
CO-1	Understand historical background of the constitution making and its importance for building a democratic India.
CO 2	Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
CO-3	Understand the value of the fundamental rights and duties for becoming good citizen of India.
CO-4	Analyze the decentralization of power between central, state and local self- government.
CO-5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

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Course Outcomes for Second Year Fourth Semester	
Course Code:201CS401	
CourseTitle: Statistics with R Programming	
CO-1	Install, Code and Use R Programming Language in R Studio IDE to perform basic tasks on Vectors, Matrices and Data frames.
CO-2	Describe key terminologies, concepts and techniques employed in Statistical Analysis.
CO-3	Define, Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems
CO-4	Conduct and interpret a variety of Hypothesis Tests to aid Decision Making
CO-5	Understand, Analyze, Interpret Correlation and Regression to analyze the underlying relationships between different variables.
Course Code: 201CS402	
Course Title : Formal Languages and Automata Theory	
CO-1	Classify machines by their power to recognize languages
CO-2	Summarize language classes & grammars relationship among them with the help of
CO-3	Chomsky hierarchy
CO-4	Employ finite state machines to solve problems in computing
CO-5	Illustrate deterministic and non-deterministic machines
Course Code : 201CS403	
Course Title : Operating Systems	
CO-1	Describe various generations of Operating System and functions of Operating System
CO-2	Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
CO-3	Solve Inter Process Communication problems using Mathematical Equations by various methods
CO-4	Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
CO-5	Outline File Systems in Windows Operating System
Course Code: 201CS404	
Course Title: Database Management Systems	
CO-1	Describe a relational database and object-oriented database
CO-2	Create, maintain and manipulate a relational database using SQL

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CO-3	Describe ER model and normalization for database design
CO-4	Examine issues in data storage and query processing and can formulate appropriate solutions
CO-5	Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage
Course Code:201CS405	
Course Title:Software Engineering	
CO-1	Choose the type of life cycle model for developing the project
CO-2	Gather the appropriate requirements for the development process
CO-3	Make proper design and architecture for the development process based on requirements
CO-4	Code the project using basic principles and test it using various testing methodologies
CO-5	Maintain the project using various types of maintenance.
Course Code: 201CS411	
Course Title: R Programming Lab	
CO-1	Install R studio and R console and import various packages.
CO-2	Perform calculations on basic mathematical operations.
CO-3	Implement basic concepts of R programming, and its different module that includes lists, Strings, Functions, Frames, Arrays.
CO-4	Importing the CSV files and perform operations.
CO-5	Implement the various statistical techniques using R.
Course Code: 201CS412	
Course Title: Database Management Systems Lab	
CO-1	By the end of the course the student will be able to
CO-2	Utilize SQL to execute queries for creating database and performing data
CO-3	manipulation operations
CO-4	Examine integrity constraints to build efficient databases
CO-5	Apply Queries using Advanced Concepts of SQL
Course Code: 201CS413	
Course Title: Operating Systems & Software Engineering Lab	
CO-1	By the end of the course the student will be able to
CO-2	Utilize SQL to execute queries for creating database and performing data
CO-3	manipulation operations
CO-4	Examine integrity constraints to build efficient databases
CO-5	Apply Queries using Advanced Concepts of SQL

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Course Code: 201CS481	
Course Title: Web Application Development Using Full Stack Module -2	
CO-1	Develop of the major Web Application Tier-Client-side development.
CO-2	Participate in the active development of cross-browser applications through JavaScript.
CO-3	Develop JavaScript applications that transition between states.
CO-4	Describe and utilize JavaScript programming concepts such as variables, arrays, conditionals, and loops.
CO-5	Deploy JavaScript code to solve practical web design problems.

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Course Outcomes for Third Year Fifth Semester	
Course Code: 201CS501	
Course Title: Data Mining and Data Warehousing	
CO-1	Implement data warehouse for heterogeneous data
CO-2	Analyze real time datasets with basic summary statistics
CO-3	Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data
CO-4	Construct a decision tree and resolve the problem of model overfitting
CO-5	Compare Apriori and FP-growth association rule mining algorithms for frequent itemset generation
Course Code:201CS502	
Course Title:Compiler Design	
CO-1	Demonstrate phases in the design of compiler
CO-2	Organize Syntax Analysis, Top Down and LL (1) grammars
CO-3	Design Bottom-Up Parsing and Construction of LR parsers
CO-4	Analyze synthesized, inherited attributes and syntax directed translation schemes
CO-5	Determine algorithms to generate code for a target machine
Course Code:201CS503	
Course Title: Computer Networks	
CO-1	The architectural principles of computer networking and compare different approaches to organizing networks.
CO-2	Familiarize with the Transmission Media, Flow Control and Error Detection & Correction
CO-3	Explain fundamentals and technologies of physical, data-link and network layers
CO-4	Fundamental concepts in Routing, Addressing & working of Transport Protocols.
CO-5	Gain familiarity with common networking & Application Protocols.
CourseCode: 201CE565a	
CourseTitle:Environmental Pollution & Control	
CO-1	Identify the air pollutant control devices
CO-2	Have knowledge on the NAAQ standards and air emission standards

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CO-3	Differentiate the treatment techniques used for sewage and industrial wastewater treatment methods.
CO-4	Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.
CO-5	Appreciate the methods of environmental sanitation and the management of community
Course Code:201EE565a	
Course Title: Fundamentals of Utilization of Electrical Energy	
CO-1	Identify most appropriate heating or welding techniques for suitable applications
CO-2	understand various level of luminosity produced by different illuminating sources
CO-3	Identify a suitable motor for electric drives and industrial applications
CO-4	Identify the various types of Industrial loads
CO-5	Understand electric traction system and drives.
Course Code: 201ME565a	
Course Title: Robotics	
CO-1	Discuss the fundamentals of robotics, their anatomy, applications in various fields
CO-2	Summarize various types of driver and end effectors used in the industrial robots
CO-3	Outline the principles of various types of sensors and machine vision systems used in robots.
CO-4	Explain the forward and inverse kinematics in 2D plane, differential motion path and trajectory planning
CO-5	Interpret the programming of robots, factors affecting the implementation, safety and economics of the robots in industries
Course Code: 201EC565a	
Course Title: Microprocessors and Microcontrollers	
CO-1	Understand architectural difference between Microprocessor and Microcontroller and its need for development of products and product development procedure
CO-2	Discuss the concepts of programming in Assembly Language
CO-3	Apply the concepts of Interfacing of 8086 microprocessor with outside world.
CO-4	Understand the architecture of AVR microcontroller
CO-5	Analyze concepts of Input/output port Interfacing of microcontroller and apply the concept of interfacing AVR micro controller with outside
Course Code: 201CS565a	
Course Title: Foundations of Operating Systems	
CO-1	Describe the general architecture of computers
CO-2	Describe, contrast and compare differing structures for operating systems
CO-3	Analyze theory and implementation of processes, resource control (Concurrency etc.), physical and virtual memory, scheduling, I/O and files

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CO-4	Illustrate Memory Management Techniques and Page Replacement Algorithms.
CO-5	Demonstrate Mass Storage Structures and Disk structure
Course Code: 201MM565a	
Course Title: Elements of Mining Technology	
CO-1	Know the various Elements of Mining and stages/phases in Mining
CO-2	Know the concepts of Mining Methods.
CO-3	Know the Drilling methods
CO-4	Understand the explosives and blasting practice in mines
CO-5	Understand the application of latest technologies in mining industry
Course Code: 201AM565a	
Course Title: Basic Automobile Engineering	
CO-1	Compare different types of automobiles and their components.
CO-2	Differentiate working principles of different types of automobile engines
CO-3	Illustrate working of different transmission elements and control systems.
CO-4	Demonstrate Automobile C ontrol systems.
CO-5	Illustrate various Eco-Friendly Vehicles
Course Code: 201PT565a	
Course Title: Fundamentals of Petroleum Engineering	
CO-1	Understand overview of petroleum industry.
CO-2	Understand Exploration and Production of petroleum industry
CO-3	Understand Gathering of Oil & Gas and Storage
CO-4	Understand Midstream of petroleum industry
CO-5	Understand Downstream of petroleum industry
Course Code: 201MB565a	
Course Title: Principles of Management	
CO-1	Understand the concepts related to management and different schools of management thoughts.
CO-2	Apply the concepts of planning for effective management.
CO-3	Identify common organizational structures and the advantages and disadvantages

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CO-4	Understand the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities and recognize the importance of employee motivation and how to promote it.
CO-5	Analyze effective application of communication in managerial decisions.
Course Code: 201CS564A	
Course Title: Natural Language Processing	
CO-1	Demonstrate a given text with basic Language features.
CO-2	Explain a rule-based system to tackle morphology/syntax of a language.
CO-3	To design an innovative application using NLP components.
CO-4	To design a tag set to be used for statistical processing for real- time applications.
CO-5	To compare and contrast the use of different statistical approaches for different types of NLP applications.
Course Code: 201CS564B	
Course Title: Data Science	
CO-1	Acquire the knowledge and expertise to become a proficient data scientist
CO-2	Demonstrate an understanding of statistics and machine learning concepts that are vital for data science
CO-3	Explain how data is collected, managed and stored for data science
CO-4	Interpret the key concepts in data science, including their real-world applications and the toolkit used by data scientists
CO-5	Illustrate data collection and management scripts using Mongo DB
Course Code: 201CS564C	
Course Title: Artificial Intelligence	
CO-1	Discuss the fundamental concepts in Artificial Intelligence
CO-2	Analyze the applications of search strategies and problem reductions.
CO-3	Apply the mathematical logic concepts
CO-4	Develop the Knowledge representations in Artificial Intelligence
CO-5	Explain the Fuzzy logic systems
Course Code: 201CE565D	
Course Title: Object Oriented Analysis & Design	
CO-1	Explain OOAD concepts and various UML diagrams
CO-2	Illustrate about domain models and conceptual classes

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CO-3	Compare and contrast various testing techniques
CO-4	Design various projects using UML diagram
CO-5	Analyze& Design behavioural aspects of a Software System using Use Case, Interaction and Activity Diagrams
Course Code: 201HB591	
Course Title: Quantitative Aptitude and Reasoning	
CO-1	Critically evaluate various real-life situations by resorting to analysis of key issues and factors.
CO-2	Represent mathematical information symbolically, visually, numerically, and verbally.
CO-3	Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
CO-4	Improve speed and accuracy in solving problems by using quicker methods
CO-5	Identify recurring and missing patterns in a sequence, which in turn helps in enhancing deductive ability.
Course Code: 201CS581	
Course Title: Web Application Development Using Full Stack Module -3	
CO-1	By the end of the course, the student will be able to
CO-2	Describe basics of Web Designing using HTML, DHTML, and CSS
CO-3	Build real world applications using client side and server-side scripting Design and develop applications using web servers' languages
CO-4	Analyze the basics of PHP programming
CO-5	Apply Database connectivity with case study for student Information System and Health Management system
Course Code: 201CS511	
Course Title: Data Mining and Data Warehousing Lab	
CO-1	Ability to understand the various kinds of tools.
CO-2	Demonstrate the classification, clustering and etc. in large data sets.
CO-3	Ability to add mining algorithms as a component to the exiting tools.
CO-4	Ability to apply mining techniques for realistic data.
CO-5	Apply the suitable visualization techniques to output analytical results

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Course Outcomes for Third Year Sixth Semester	
Course Code: 201CS601	
Course Title: Cryptography & Network Security	
CO-1	Analyze the security principles and corresponding attacks.
CO-2	Apply different encryption algorithms to message security
CO-3	Evaluate and Analyze Hashing Algorithms
CO-4	To be familiar with the IP and Transport layer security.
CO-5	To be familiar with network security designs using available secure solutions (suchasPGP, SSL, IPSec, etc)
Course Code:201CS602	
Course Title: Big Data Analytics	
CO-1	Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
CO-2	Acquire fundamental enabling techniques and scalable algorithms like Hadoop in Bigdata Analytics.
CO-3	Understand the need and application of Map Reduce
CO-4	Understand Hive to explore and analyze huge datasets.
CO-5	Understand Spark Framework and execution Model
Course Code: 201CS603	
Course Title: Machine Learning	
CO-1	Explore the concepts related to Machine Learning techniques.
CO-2	Demonstrate Pre-processing techniques and perform exploratory data analysis relatedto a scenario.
CO-3	Identify and apply the appropriate techniques to process the data and solve the applications using machine learning techniques
CO-4	Apply data analytics principles and techniques of Machine learning to solve real time problems
CO-5	Design application using machine learning techniques
Course Code: 201CE665a	
Course Title: Solid Waste Management	
CO-1	Understand the Objects of Solid waste management
CO-2	Understand the elements of Solid waste management
CO-3	Design the Transportation facility in Solid waste management
CO-4	Characterize the solid waste and design a composting facility.
CO-5	Know the criteria for selection of landfill

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Course Code: 201CE665a	
Course Title: Concepts of Power System Engineering	
CO-1	Understand about hydro-electric power plants
CO-2	Understand about Thermal power plants
CO-3	Understand about Nuclear power plants
CO-4	Understand about Nuclear power plants
CO-5	Understand about Biomass
Course Code: 201EE665a	
Course Title: Introduction to MEMS	
CO-1	Discuss the principles and various steps of different micro machining and fabrication techniques.
CO-2	Explain the working principle and fabrication methods of Micro mechanical sensors and actuators.
CO-3	Describe the working principles and construction of various thermal sensor and actuators.
CO-4	Discuss the working principles and fabrication techniques of Magnetic sensors and actuators, and MOEMS devices.
CO-5	Identify different micro fluid actuation techniques and explain the working and construction of Bio MEMS devices.
Course Code: 201EC665a	
Course Title: IOT and its Applications	
CO-1	Learn the Architecture of iot, Sensors, Actuators, ARM processors.
CO-2	Learn the various Communication protocols present in a network.
CO-3	Apply the practical knowledge to Arduino board
CO-4	Analyze the Machine learning and various network services.
CO-5	Learn the importance of Big data and Virtualization concepts.
Course Code: 201CS665a	
Course Title: Fundamentals of Databases	
CO-1	Obtain the knowledge about Database Management System.
CO-2	Accord description of the Database Management structure and comprehend the applications of Databases.
CO-3	Realize the advantages and disadvantages of the different models.
CO-4	Perceive the constraints and controversies associated with relational database.
CO-5	Explain the concept of data planning and Database design and identify the various functions of Database Administrator

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Course Code: 201MM665a	
Course Title: Open Pit Slope Analysis and Design	
CO-1	Classify various modes of slope failure.
CO-2	Comprehend and analyze the geotechnical parameters required for slope stability analysis.
CO-3	Interpret the shear strength of intact rock mass and jointed rock mass.
CO-4	Analyze the flow of water in slope stability.
CO-5	Summarize various methods and techniques used to assess the slope stability.
Course Code: 201AM665a	
Course Title: Hybrid and Electric Vehicles	
CO-1	Grade hybrid electric technology and electronic drive trains
CO-2	Construction of hybrid electric vehicles
CO-3	Demonstrate electric vehicle components
CO-4	Construction of Electric vehicle technology
CO-5	Operate fuel cell technology and Identification of fuel cell-based vehicles
Course Code: 201PT665a	
Course Title: Basic Concepts in Petroleum Drilling Engineering	
CO-1	Understand overview of drilling and rig components
CO-2	Understand selection of drill string and drill bit
CO-3	Understand mud circulation system
CO-4	Understand basics of casing and cementing
CO-5	Understand borehole problems
Course Code:201MB665a	
Course Title: Operations Management	
CO-1	Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness.
CO-2	Analyze and evaluate various facility alternatives and their capacity decisions, develop a balanced line of production & scheduling and sequencing techniques in operation environments.
CO-3	Develop aggregate capacity plans and MPS in operation environment.

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CO-4	Plan and implement suitable materials handling principles and practices in the operations.
CO-5	Plan and implement suitable quality control measures in Quality Circles to TQM.
Course Code:201CS664A	
Course Title: Software Testing Methodologies	
CO-1	Apply software testing knowledge and engineering methods.
CO-2	Design and conduct a software test process for a software testing project.
CO-3	Know and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.
CO-4	Identify the needs of software test automation, and define and develop a test tool to support test automation.
CO-5	Demonstrate about the Testability Tips.
Course Code:201CS664B	
Course Title: E-COMMERCE	
CO-1	Demonstrate the basic concepts and technologies used in the field of management information systems.
CO-2	Acquire the knowledge of the different types of management information system.
CO-3	Accord the processes of developing and implementing information systems.
CO-4	Identify the e-businesses Consumer oriented e-Commerce process
CO-5	Apply Web advertising and Web publishing in Internet
Course Code:201CS664C	
Course Title: Mean Stack Technologies	
CO-1	Identify the basic concepts of Web&Markup Languages.
CO-2	Develop web Applications using Scripting Languages & Frameworks.
CO-3	Make use of Express JS and Node JS frameworks
CO-4	Illustrate the uses of web services concepts like restful, react js.
CO-5	Adapt to Deployment Techniques & Working with cloud platform.

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Course Code:201CS664D	
Course Title: Advanced Data Structures	
CO-1	Describe and implement a variety of advanced data structures (hash tables,priority queues balanced search trees, graphs).
CO-2	Demonstrate the use of external memory and external search and sorting algorithms.
CO-3	Demonstrate the operations such as Insertion, Deletion and Search on Advanced Data structures like Heaps, AVL trees and B Trees.
CO-4	Analyze the space and time complexity of the algorithms studied the course.
CO-5	Comparisons of trees like Red Black trees and Splay Trees
Course Code: 201MB691	
Course Title: IPR and Patents	
CO-1	Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents
CO-2	Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements
CO-3	Enhance technical skills to get patents and understand copyright laws.
CO-4	Analyze the Laws relating to the Trade Marks.
CO-5	Explore the Trade Secrets & Cyber Law and Cyber Crime
Course Code: 201HB681	
Course Title: English for Career	
CO-1	Comprehend the necessity to improve four language skills
CO-2	Acquire knowledge about public speaking ability
CO-3	Strengthen their grammatical skills in the language
CO-4	Enhance necessary vocabulary and academic writing skills
CO-5	Enhance academic writing skills
Course Code:201CS611	
Course Title: Cryptography & Network Security Lab	
CO-1	Analyze the security principles and corresponding attacks.

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CO-2	Apply different encryption algorithms to message security
CO-3	Evaluate and Analyze Hashing Algorithms
CO-4	Implement the Diffie-Hellman Key Exchange mechanism
CO-5	Apply MD5 and SHA-1 algorithms to a message
Course Code:201CS612	
Course Title: Big Data Analytics Lab	
CO-1	Comprehend Big Data and its analytics in the real world
CO-2	Analyze the Big Data framework like Hadoop and NOSQL to efficiently store and process.
CO-3	Big Data to generate analytics Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm
CO-4	Depict and Implementation of Big Data Analytics using pig to solve data intensive problems and to generate analytics
CO-5	Depict and Implementation of Big Data Analytics using spark to solve data intensive problems
Course Code:201CS612	
Course Title: Machine Learning using Python Lab	
CO-1	Comprehend complexity of Machine Learning algorithms and their limitations.
CO-2	Develop skills of using recent machine learning software for solving practical problems.
CO-3	Comprehend modern notions in data analysis-oriented computing.
CO-4	Apply common Machine Learning algorithms in practice and implementing their own.
CO-5	Implement experiments in Machine Learning using real-world data.

Course Outcomes for Fourth Year Seventh Semester	
Course Code:201CS761A	
Course Title: Professional Elective-III (Distributed Systems)	
CO-1	Discuss trends in Distributed Systems
CO-2	Determine Concepts and access System Basic Distributed System Architecture.
CO-3	Apply network virtualization.
CO-4	Apply remote method invocation and objects.
CO-5	Design process and resource management systems.

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Course Code:201CS761B	
Course Title: Professional Elective-III (Cloud Computing)	
CO-1	Illustrate the key dimensions of the challenge of Cloud Computing
CO-2	Classify the Levels of Virtualization and mechanism of tools.
CO-3	Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
CO-4	Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
CO-5	Assess control storage systems and cloud security, the risks involved its impact and develop cloud application
Course Code: 201CS761C	
Course Title: Professional Elective-III (Mobile Computing)	
CO-1	Think and develop new mobile application.
CO-2	Take any new technical issue related to this new paradigm and come up with a solution(s).
CO-3	Develop new ad hoc network applications and/or algorithms/protocols.
CO-4	Analyze the Mobile Network Layer system working
CO-5	Deploy & develop any existing or new protocol related to mobile environment
Course Code:201CS761D	
Course Title: Ad-hoc and Sensor Networks	
CO-1	To make the student understand the concepts of MOBILE AD HOC NETWORKS (Manets) as well as Wireless Sensor Networks (WSN), their characteristics, novel applications, and technical challenges.
CO-2	To understand the issues and solutions of various layers of Manets, namely MAC layer, Network Layer & Transport Layer in Manets and WSN.
CO-3	To understand the platforms and protocols used in Manets and WSN.
CO-4	To make the student take up further research as part of his higher studies
CO-5	To make the student understand the concepts of MOBILE AD HOC NETWORKS (Manets) as well as Wireless Sensor Networks (WSN), their characteristics, novel applications, and technical challenges.
Course Code: 201CS762A	
Course Title: Software Project Management	

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CO-1	Understand the basic concepts and issues of software project management and to match organizational needs
CO-2	Effectively Plan the software projects that address real-world management challenges and Design various estimation levels of cost and effort
CO-3	Plan the software projects and to implement the project plans through managing people, communications and change
CO-4	Select and employ mechanisms for tracking the software projects and to conduct activities necessary to successfully complete and close the software projects
CO-5	Develop the skills for tracking and controlling software deliverables and to create project plans that address real-world management challenges
Course Code: 201CS762B	
Course Title: Software Quality Management	
CO-1	Choose the appropriate model for software quality
CO-2	Measure the quality of the product using various metrics
CO-3	Make the Quality plan and documentation
CO-4	Choose the appropriate model for Quality Management
CO-5	Understand the quality standards
Course Code: 201CS762C	
Course Title: Cyber Security & Forensics	
CO-1	Enumerate the computer forensics fundamentals
CO-2	Describe the types of computer forensics technology
CO-3	Analyze various computer forensics systems
CO-4	Illustrate the methods for data recovery, evidence collection and data seizure
CO-5	Identify the Role of CERT-In Security
Course Code: 201CS763A	
Course Title: Professional Elective-V (Deep Learning Techniques	
CO-1	Demonstrate the basic concepts fundamental learning techniques and layers.
CO-2	Discuss the Neural Network training, various random models.
CO-3	Explain different types of deep learning network models.
CO-4	Classify the Probabilistic Neural Networks.
CO-5	Implement tools on Deep Learning techniques

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Course Code: 201CS763B	
Course Title: Professional Elective-V (Soft Computing)	
CO-1	Apply neural networks, for solving different engineering problems.
CO-2	Identify and describe soft computing techniques and build supervised learning and unsupervised learning networks.
CO-3	Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
CO-4	Apply genetic algorithms to combinatorial optimization problems
CO-5	Apply neural networks, for solving different engineering problems.
Course Code: 201CS763C	
Course Title: Professional Elective-V (Block Chain Technologies)	
CO-1	Demonstrate the block chain basics, Crypto currency
CO-2	To compare and contrast the use of different private vs public block chain and use cases
CO-3	Design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins
CO-4	Classify Permission Block chain and use cases- Hyper ledger, Corda
CO-5	Make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems, and others
Course Code: 201CS763D	
Course Title: Professional Elective-V (MOOCS-NPTEL/SWAYAM)	
CO-1	Evaluate vulnerability of an information system and establish a plan for risk management.
CO-2	Demonstrate basic principles of Web application security
CO-3	Evaluate the authentication and encryption needs of an information system.
CO-4	Demonstrate how to secure a network
CO-5	Evaluate a company's security policies and procedures
Course Code: 201CE764a	
Course Title: Building Technology	
CO-1	Know the different elements of the buildings.
CO-2	Know the different materials of the buildings.
CO-3	Determine various specifications of materials.
CO-4	Determine various dimensions of buildings.
CO-5	prepare the Plans of the buildings.
CO-5	Know the different elements of the buildings.
Course Code:201EE764a	
Course Title: Fundamentals of Smart Grid Technologies	
CO-1	Provide the students an understanding of the basic concepts of smart grid technologies
CO-2	Analyse the communication technologies used in smart grids

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CO-3	Understand the concepts of information security for smart grid.
CO-4	Understand the concept of smart metering
CO-5	Understand communication infrastructure and protocols for smart metering.
Course Code:201ME764a	
Course Title: Nano Technology and its Applications	
CO-1	Discuss the fundamentals of robotics, their anatomy, applications in various fields.
CO-2	Summarize various types of drives and end effectors used in the industrial robots.
CO-3	Outline the principles of various types of sensor and machine vision systems used in robots.
CO-4	Explain the forward and inverse kinematics in 2D plane, differential motion, path and trajectory planning.
CO-5	Interpret the programming of robots, factors affecting the implementation, safety and economics of the robots in industries.
Course Code:201EC764a	
Course Title: Embedded Systems	
CO-1	Understand the basic concepts of an embedded system
CO-2	An embedded system design approach to perform a specific function
CO-3	The hardware components required for an embedded system and the design approach of an embedded hardware.
CO-4	The various embedded firmware design approaches on embedded environment.
CO-5	Understand how to integrate hardware and firmware of an embedded system using real time
Course Code:201CS764a	
Course Title: Information Security	
CO-1	Evaluate vulnerability of an information system and establish a plan for risk management.
CO-2	Demonstrate basic principles of Web application security
CO-3	Evaluate the authentication and encryption needs of an information system.
CO-4	Demonstrate how to secure a network
CO-5	Evaluate a company's security policies and procedures
Course Code:201MM764a	
Course Title: Mining and its Importance	
CO-1	Understand the role of mining industry for development of nation.
CO-2	Classify the coal mining methods.
CO-3	Understand the concepts of metal mining.
CO-4	Assess the sustainable mining practices in India and abroad
CO-5	Summarize the applications of different sensors for mining industry.

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Course Code:201AM764a	
Course Title: Modern Vehicle Technology	
CO-1	Integrate modern vehicles
CO-2	Design modern suspension systems for automobile safety and comfort
CO-3	Analyze and control the exhaust emissions and noise
CO-4	Analyze the vehicle operation, incorporate and develop the electronic control systems
CO-5	Distinguish and choose the fuel injection system
Course Code:201PT764a	
Course Title: Introduction to Petroleum Production Engineering	
CO-1	Identify the well head equipment
CO-2	Identify the different types of well completion
CO-3	Understand well activation and stimulate well for improving the flow at well bore
CO-4	Identify well production problems and apply mitigation techniques
CO-5	Understand work over jobs for oil well
Course Code: 201MB764a	
Course Title: Entrepreneurship for Engineers	
CO-1	Pick up about Foundation of Entrepreneurship Development and its theories
CO-2	Demonstrate an ability to engage in critical thinking by analyzing situations and constructing and selecting viable solutions to solve problems.
CO-3	Analyze the various aspects, scope and challenges under an entrepreneurial venture.
CO-4	Understand various steps involved in starting a venture and to explore marketing methods & new trends in entrepreneurship.
CO-5	Explain classification and types of entrepreneurs and the process of entrepreneurial project development.
Course Code: 201CE765a	
Course Title: Safety Engineering	
CO-1	To outline the different safety concepts and Job Safety analysis.
CO-2	To outline and explain the Human and vehicle characteristics and protective devices.
CO-3	To identify and suggest suitable mitigation measures in construction industry.
CO-4	Investigate the Railway risk and safety operations
CO-5	To explain the operation of various types of Irrigation System Accidents

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Course Code: 201EE765a	
Course Title: Basics of Electrical Measurements and Instrumentation	
CO-1	To acquire knowledge on Basic functional elements of instrumentation
CO-2	Ability to compare between various measurement techniques
CO-3	To acquire knowledge on Various storage and display devices
CO-4	To understand the concepts Various transducers and the data acquisition systems
CO-5	Ability to model and analyze electrical and electronic Instruments and understand the operational features of display Devices and Data Acquisition System
Course Code:201ME765a	
Course Title: Introduction to Operations Research	
CO-1	Describe various operations research models and their applications.
CO-2	Solve various engineering and managerial problems of LPP, transportation, assignment, sequencing and replacement.
CO-3	Apply game theory in different competitive situations.
CO-4	Solve the problems related to theories of waiting line and inventory models.
CO-5	Apply the principles of dynamic programming and simulation framework to solve various decision making situations.
Course Code: 201EC765a	
Course Title: Digital Image Processing	
CO-1	Learn the basics of digital image processing and image transforms.
CO-2	Learn the various techniques to enhance digital images in the spatial and frequency domain.
CO-3	Apply various techniques of image segmentation to digital images.
CO-4	Analyze the concepts of color image processing and understand various coding techniques for digital image compression.
CO-5	Learn various algorithms of morphological image processing.
Course Code: 201CS765a	
Course Title: Human Computer Interaction	
CO-1	Explain the capabilities of both humans and computers from the viewpoint of human information processing.
CO-2	Identify the various tools and techniques for interface analysis, design, and evaluation
CO-3	Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.
CO-4	Apply an interactive design process and universal design principles to designing HCI systems.
CO-5	Identify the challenges and apply information visualization

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Course Code: 201MM765a	
Course Title: Remote Sensing & GIS in Mining	
CO-1	Outline the basic principles of Remote Sensing.
CO-2	Develop the concepts of visual and digital image analysis
CO-3	Summarize the basic concepts of GIS
CO-4	Perform spatial analysis.
CO-5	Apply knowledge of remote sensing and GIS in various fields
Course Code: 201AM765a	
Course Title: Alternative Energy Resources for Automotives	
CO-1	Produce and use vegetable oils, gaseous fuels, hydrogen fuels, alcohol fuels
CO-2	Determine the properties, performance, emission characteristics of alternative fuels
CO-3	Evaluate alternative fuels on fossil fuels when use in combination with both fuels
CO-4	Design, analyze and build the electric and hybrid automobiles
CO-5	Understand working of fuel cell and solar cars
Course Code:201PT765a	
Course Title: Basic Concepts in Reservoir Engineering	
CO-1	Identify Reservoir rock properties
CO-2	Understand the phase behaviour of reservoir fluid.
CO-3	Understand fluid flow through porous media
CO-4	Identify type of drive mechanism and calculate the reserve estimation
CO-5	Understand the reservoir development in oil filed.
Course Code: 201MB765a	
Course Title: Digital Marketing	
CO-1	Gain Knowledge of overall understanding of digital marketing
CO-2	Develop insight on current trends – digital and social statistics (Infographics)
CO-3	Provide an introduction to digital marketing platforms like... Facebook, Twitter, YouTube, Pinterest, etc.
CO-4	Learn the knowledge of SEO& SEM.
CO-5	Learn Web analytics.
Course Code: 201MB7961	
Course Title: UHV 2 Understanding Harmony	
CO-1	Become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while

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CO-2	They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
Course Code: 201CS707	
Course Title: Deep Learning using Python	
CO-1	Develop various applications using computer vision.
CO-2	Develop various applications using structured data.
CO-3	Develop different applications using time series analysis.
CO-4	Design various applications using audio and video data.
CO-5	Design various applications using natural language processing.

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GRBT-20 Automobile Engineering

VISION:

To make a preferred destination to the students to become competent automobile engineer to meet the global demands with moral & ethical values and entrepreneurial skills, making the campus vibrant to derive utmost pleasure to both the staff & students, and to be recognised as a pioneer research centre to serve the society through application of scientific and engineering methods, innovative ideas, and discoveries.

MISSION :

The department is committed to impart best knowledge through teaching regular practices and updating new technologies through utilization of software tools, sophisticated teaching aidsguest lectures, workshops, seminars and conferences bridging the gap between industry and college through frequent industrial visits carrying out world class research projects inculcating moral & ethical values and encouraging the student towards social work developing entrepreneurial skills

Programme Educational Objectives of Automobile Engineering:

Within a few years after completion of the program the graduate will be;

- PEO1: Sound knowledge in mathematical, scientific and engineering fundamentals to meet the professional demands of the automobile industries in India and around the world
- PEO2: Synthesize the data, technical concepts and software tools, for application to automotive design and investigation.
- PEO3: Design, plan and execute entrepreneurial projects related to automobile industries in orderly manner and can meet financial constraints.

Programme Outcomes Automobile Engineering:

At the end of the program the student is able to;

1. Apply the knowledge in mathematics, science and engineering for practical problems with ease.
2. Design and conduct experiments, interpret data, analyze it and report results.
3. Design an Automobile or relevant system that meets the comfort and safety of the user or worker with global standards.
4. Investigate and unearth the causes of failure of automobile components, industrial accidents, road mishaps or crimes.
5. Familiar with modern engineering tools, equipment and software tools to analyze the problems.
6. Confident to apply engineering solutions in global and societal context.
7. Find the causes of environment pollution and solutions for sustainability.
8. Understand the professional and ethical values and act accordingly.
9. Transform the innovative ideas individually as well as with engineering & science laboratory teams and multidisciplinary teams.
10. Communicate effectively in verbally, graphically and written forms to increase coordination and cooperation in the team.
11. Design, plan and execute projects in orderly manner and meet the financial and other constraints.
12. Understand the impact of modern technology on society by the awareness of the contemporary issues and act appropriately throughout life.

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Programme Specific Outcomes of Automobile Engineering:

PSO 1: Ability to apply various engineering principles and CAD/CAM software to design, manufacture and analyze automobile systems, subsystems and components.

PSO 2: Ability to establish startups in automobile field to manufacture subsystems or vehicle maintenance.

PSO 3: Ability to operate, maintain, trouble shoot and rectify various types of automobiles.

Course Outcomes for all Semester Courses	
Course Code: 201HB101	
Course Title: MATHEMATICS-I	
CO-1	Transform the knowledge of solving system of linear equations using matrices
CO-2	Evaluate nature of the Quadratic form
CO-3	Acquire the knowledge maxima and minima of the function with several variables
CO-4	Evaluate multiple integrals and their applications
CO-5	Understand and apply vector derivatives and vector integration on theorems
Course Code: 201HB102	
Course Title: COMMUNICATIVE ENGLISH-I	
CO-1	Develop effective reading strategies
CO-2	Demonstrate writing skills that are required for professional development and use graphic elements
CO-3	Apply grammatical skills and vocabulary effectively in speech and writing
CO-4	Display language efficacy in tune with subjective knowledge
CO-5	Use required language along with contextual vocabulary and grammar structures
Course Code: 201HB103b	
Course Title: ENGINEERING CHEMISTRY	
CO-1	Understand the removal techniques of hardness of water
CO-2	Distinguish the fuel cells and batteries
CO-3	Identify different control techniques of corrosion
CO-4	Understand the concepts of plastics and rubbers
CO-5	Analyse the importance of nano materials

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Course Code: 201EE104	
Course Title: BASIC ELECTRICAL & ELECTRONICS ENGINEERING	
CO-1	Analyze the various electrical networks
CO-2	Understand the operation of DC machines, 3-point starter and conduct the Swinburne's Test.
CO-3	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors
CO-4	Analyze the operation of half Wave, full wave rectifiers, op-amps
CO-5	Explain the single stage CE amplifier and concept of feedback amplifier.
Course Code: 201ME105	
Course Title: ENGINEERING GRAPHICS	
CO-1	Apply principles of drawing to represent dimensions of an object.
CO-2	Outline the polygons and engineering curves.
CO-3	Illustrate projections of points, lines, planes and solids.
CO-4	Illustrate the 3D views through isometric views.
CO-5	Create the isometric views and orthographic views
Course Code: 201HB111b	
Course Title: ENGINEERING CHEMISTRY LABORATORY	
CO-1	Explain the functioning of the instruments such as PH, Conductivity and Potentiometric
CO-2	Determine the total hardness of water
CO-3	Perform various Redox titrations
CO-4	Preparation of polymers
CO-5	Compare viscosities of different oils
Course Code: 201EE112	
Course Title: BASIC ELECTRICAL & ELECTRONICS LABORATORY	
CO-1	Analyze the various electrical networks
CO-2	Understand the operation or DC machines,3 -point starter and conduct the Swinburne's Test.
CO-3	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction
CO-4	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO-5	Explain the single stage CE amplifier and concept of feedback amplifier.
Course Code: 201ME113d	
Course Title: BASIC ENGINEERING WORKSHOP	
CO-1	Experiment with various basic house wiring techniques.

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CO-2	Develop basic prototype in the trade of tin smithy such as square tray and open scoop.
CO-3	Design v-fitting and square fitting in the trade of fittin
CO-4	Making square rod and L-bend from the round rod in black smithy
CO-5	Build various prototype like T lap joint, dovetail joint, cross lap etc. in the trade of carpentry.
Course Code: 201HB201	
Course Title: MATHEMATICS–II	
CO-1	Solve first order differential equations.
CO-2	Solve higher order differential equations with constant coefficients.
CO-3	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems.
CO-4	Understand numerical differentiation and integration.
CO-5	Apply the Knowledge of different algorithms for approximating the solution of ordinary differential equations in practical Engineering problems.
Course Code: 201HB202b	
Course Title: ENGINEERING PHYSICS	
CO-1	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution. To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics.
CO-2	To assess the electromagnetic wave propagation in different media and its power andexplain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors.
CO-3	To study the basic Quantum mechanics, interpretation of the direct and indirect bandgap in semiconductors and identify the type of semiconductor using Hall effect.
CO-4	To interpret dielectric loss, Lorentz field and Claussius - Mosotti relation and classify the magnetic materials based on susceptibility and their temperature dependence. To apply the Gauss' Theorem for divergence and Stokes' theorem for curl and evaluate Maxwell's displacement current and correction in Ampere's law.
Course Code: 201ME203a	
Course Title: ENGINEERING MECHANICS	
CO-1	Carry out composition of system of forces.
CO-2	Analyse rigid bodies in static equilibrium condition under system of forces including friction.
CO-3	Determine centre of gravity and moment of inertia of simple and composite planar, solid sections.
CO-4	Carry out dynamic analysis of rigid bodies under translation, rotation and plane motion.
CO-5	Apply work energy and impulse momentum principles to rigid body motion.

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Course Code: 201CS204a	
Course Title: FUNDAMENTALS OF COMPUTER PROGRAMMING	
CO-1	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO-2	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO-3	Develop program by using Control structure, different looping and Jump statement.
CO-4	Implement applications of Array, Structure and String inside the program.
CO-5	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.
Course Code: 201AM205	
Course Title: FUNDAMENTALS OF AUTOMOBILE ENGINEERING	
CO-1	Compare different types of automobiles and their components.
CO-2	Differentiate working principles of different types of automobile engines.
CO-3	Illustrate working of different transmission elements and control systems.
CO-4	Demonstrate Automobile Control systems.
CO-5	Illustrate various Eco-Friendly Vehicles.
Course Code: 201HB296	
Course Title: ENVIRONMENTAL SCIENCE	
CO-1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO-2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO-3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO-4	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO-5	Influence their society in proper utilization of goods and services.
Course Code: 201HB211b	
Course Title: ENGINEERING PHYSICS LABORATORY	
CO-1	To handle optical instruments like microscope and spectrometer, determine thickness of a hair/paper with the concept of interference and to estimate the wavelength and resolving power of different colours using diffraction grating
CO-2	To demonstrate the importance of dielectric material in storage of electric field energy in the apacitors and plot the intensity of the magnetic field of circular coil carrying current with varying distance
CO-3	To evaluate the acceleration due to gravity using compound pendulum
CO-4	To determine the moment of inertia using Fly wheel

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Course Code: 201HB212	
Course Title: COMMUNICATIVE ENGLISH LABORATORY	
CO-1	Learn to communicate in English
CO-2	Comprehend native speaker's accent.
CO-3	Speak appropriately in real life situations
CO-4	Display public speaking skills in the required context
CO-5	Handle different communicative situations
Course Code: 201CS213a	
Course Title: FNDAMENTALS OF COMPUTER PROGRAMMING LABORATORY	
CO-1	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO-2	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO-3	Develop program by using Control structure, different looping and Jump statement.
CO-4	Implement applications of Array, Structure and String inside the program.
CO-5	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.
COURSE CODE: 201HB301	
COURSE TITLE: MATHEMATICS-III	
CO-1	Apply the knowledge of Beta and Gamma function.
CO-2	Apply the knowledge of Laplace transform
CO-3	Evaluate Fourier series for different functions. Understand properties of Fourier transformation apply for different functions.
CO-4	Solve first order partial differential equations.
CO-5	Solve high order partial differential equations with constant coefficients.
COURSE CODE: 201AM302	
COURSE TITLE: Metallurgy & Materials Science	
CO-1	Understand the crystalline structure of different metals and study the stability of phases in different alloy systems
CO-2	Study the behaviour of ferrous and non-ferrous metals and alloys and their application in different domains
CO-3	Able to understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals
CO-4	Grasp the methods of making of metal powders and applications of powder metallurgy

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CO-5	Comprehend the properties and applications of ceramic, composites and other advanced materials.
COURSE CODE: 201AM303	
COURSE TITLE:Mechanics of Solids	
CO-1	Model &analyze the behaviour of basic structural members subjected to various loading and support conditions based on principles of equilibrium.
CO-2	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 to rsio nal moment
CO-3	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.
CO-4	Students attain a deeper understanding of the loads, stresses, and strains acting on a structure and their relations in the elastic behaviour
CO-5	Design and analysis of Industrial components like pressure vessels
COURSE CODE: 201AM304	
COURSE TITLE: Fluid Mechanics & Hydraulic Machines	
CO-1	The basic concepts of fluid properties.
CO-2	The mechanics of fluids in static and dynamic conditions.
CO-3	Boundary layer theory, flow separation and dimensional analysis.
CO-4	Hydrodynamic forces of jet on vanes in different positions
CO-5	Working Principles and performance evaluation of hydraulic pump and turbines
COURSE CODE: 201AM305	
COURSE TITLE: Automobile Chassis Components	
CO-1	Identify the different types of frame and chassis used in Automotive
CO-2	Relate different types of drive lines and drives used in Automotive
CO-3	Acquire knowledge about different types of front axle and rear axles used in motor vehicles.
CO-4	Examine the working principle of conventional and independent suspension systems
CO-5	Apply knowledge on working principles of brake and its subsystems.
COURSE CODE: 201AM311	
COURSE TITLE: Mechanics of Solids& Metallurgy Lab	
CO-1	Model &analyze the behavior of basic structural members subjected to various loading and support conditions based on principles of equilibrium
CO-2	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.

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CO-3	Students attain a deeper understanding of the loads, stresses, and strains acting on a structure and their relations in the elastic behavior
CO-4	Study the behavior of ferrous and non-ferrous metals and alloys and their application in different domains
CO-5	Able to understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals.
COURSE CODE: 201AM312	
COURSE TITLE: Automobile Chassis Components Lab	
CO-1	Demonstrate working of transmission systems such as clutch, gear box, propeller shaft, differential etc.
CO-2	Demonstrate working of various control systems such as brakes, steering
CO-3	Demonstrate working of various suspension systems
CO-4	Demonstrate assembling and disassembling of several automobile chassis components
CO-5	Differentiate various subsystems of two, three & Four-wheeler vehicles iii. Develop skills in Dismantling and assembling of chassis components.
COURSE CODE: 201AM313	
COURSE TITLE: Fluid Mechanics &Hydraulic Machines Lab	
CO-1	Demonstrate basic concepts of fluid properties
CO-2	Experience the mechanics of fluids in static and dynamic conditions.
CO-3	Demonstrate Hydrodynamic forces of jet on vanes in different positions.
CO-4	Estimate performance of various pumps
CO-5	Estimate performance of various hydraulic turbines
Course Code: 201MB401	
Course Title: PROBABILITY & STATISTICS	
CO-1	Apply the knowledge of descriptive statistics and method of data science in practical engineering
CO-2	Apply the knowledge of Probability in Practical Engineering problems
CO-3	Demonstrate the knowledge of Probability distributions
CO-4	Enhance the knowledge in Sampling & Estimation techniques
CO-5	Enhance the knowledge in Design of Experiments
Course Code: 201AM402	
Course Title: THERMODYNAMICS	
CO-1	Basic Concepts of Thermodynamics
CO-2	Laws of Thermodynamics
CO-3	Concept of Entropy
CO-4	Property Evaluation of vapours and their depiction in tables and charts

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CO-5	Evaluation of properties of perfect gas mixtures
Course Code: 201AM403	
Course Title: AUTOMOBILE ENGINES	
CO-1	Analyse and conduct the experiments of the automotive SI and CI engines
CO-2	Investigate the thermochemistry of air-fuel mixtures
CO-3	Compare the properties and combustion of gasoline, diesel fuel processes
CO-4	Design and solve the problems of various operating parameters of the engine
CO-5	Analyse and plot the performance and pollution characteristics of IC engines
Course Code: 201ME404	
Course Title: INDUSTRIAL ENGINEERING & MANAGEMENT	
CO-1	Understand Industrial Engineering fundamental and interpret the principles
CO-2	Design and conduct experiments, analyse, interpret data and synthesis valid conclusions
CO-3:	Design a system component, or process, and synthesis solutions to achieve desired needs
CO-4	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
CO-5	Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management
Course Code:201AM405	
Course Title: AUTOMOBILE ELECTRICAL & AUTOTRONICS	
CO-1	Analyse, choose and diagnose the battery
CO-2	Select, analyse and diagnose the ignition, charging system and alternator
CO-3	Incorporate electrical systems in a vehicle
CO-4	Analyze, Establish and diagnose the electronic control system
CO-5	Understand working of electronic controlled fuel systems
Course Code: 201AM501	
Course Title: KINEMATICS OF MACHINERY	
CO-1	Create the motion of the component and design the basic geometry of the mechanisms.
CO-2	Determine the velocities and acceleration of the machine members.
CO-3	Determine the degrees of freedom for a particular combination of linkages
CO-4	Design the mechanisms

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CO-5	Develop mechanisms
Course Code: 201AM502	
Course Title: PRODUCTION TECHNOLOGY	
CO-1	Able to design the patterns and core boxes for metal casting processes
CO-2	Able to design the gating system for different metallic components
CO-3	Know the different types of welding processes
CO-4	Learn about plastic deformation processes
CO-5	Understand various sheet metal forming processes
Course Code:201AM503	
Course Title: DESIGN OF AUTOMOTIVE ELEMENTS	
CO-1	Apply theories of failures and estimate strength of a machine member
CO-2	Design a riveted, welded and bolted joints and choose the joining process
CO-3	Design, analyze and choose shafts and couplings
CO-4	Select and utilize bearings for particular applications
CO-5	Design, analyze the various engine parts
Course Code: 201AM564A	
Course Title: HYBRID, ELECTRIC & FUEL CELL VEHICLES	
CO-1	Determination of hybrid electric technology and electronic drive trines
CO-2	Construction of hybrid electric vehicles
CO-3	Demonstrate electric vehicle components
CO-4	Construction of Electric vehicle technology
CO-5	Operate fuel cell technology and Identification of fuel cell-based vehicles
Course Code: 201PT565a	
Course Title: FUNDAMENTAL OF PETROLEUM ENGINEERING	
CO-1	Understand overview of petroleum industry.
CO-2	Understand Exploration and Production of petroleum industry
CO-3	Understand Gathering of Oil & Gas and Storage
CO-4	Understand Midstream of petroleum industry
CO-5	Understand Downstream of petroleum industry

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Course Code: 201AM601	
Course Title: DYNAMICS OF MACHINERY	
CO-1	Analyze stabilization of sea vehicles, aircrafts and automobiles
CO-2	Compute frictional losses, torque, transmission of mechanical systems
CO-3	Analyze dynamic force analysis of slider crank mechanism and design of flywheel
CO-4	Describe how to determine the natural frequencies of continuous system starting from the general
CO-5	Estimate the unbalanced forces in reciprocating and rotary masses
Course Code: 201AM602	
Course Title: HEAT TRANSFER	
CO-1	Represent the physical problems of heat transfer in terms of governing equations or mathematical models
CO-2	Differentiate between different boundary conditions and apply the same for solving heat transfer problems
CO-3	Design thermal systems applying the concepts of heat transfer under steady state and well as unsteady state conditions
CO-4	Design, select and analyse the heat exchangers
CO-5	Apply the radiation concepts to the engineering devices
Course Code: 201AM603	
Course Title: AUTOMATION POLLUTION & CONTROL	
CO-1	Analyse and identify the emissions released from the IC engines
CO-2	Aware of pollution norms of various countries
CO-3	Use the pollution norms while designing and manufacturing the vehicles
CO-4	Estimate the cost of a vehicle project
CO-5	Measure the pollutants
Course Code: 201AM664B	
Course Title: ALTERNATIVE ENERGY SOURCES FOR AUTOMOBILES	
CO-1	Produce and use the alternative fuels
CO-2	Determine and predict the properties, performance, emission characteristics of alternative fuels
CO-3	Judge the effect of alternative fuels on fossil fuels when use in combination with both fuels
CO-4	Design, analyse and build the electric and hybrid automobiles
CO-5	Demonstrate the importance of using alternative fuels for sustainable energy supply and for emission control in IC engines
Course Code: 201PT665a	
Course Title: BASIC CONCEPTS IN PETROLEUM DRILLING ENGINEERING	

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CO-1	Understand over view of drilling and rig components
CO-2	Understand selection of drill string and drill bit
CO-3	Understand mud circulation system
CO-4	Understand basics of casing and cementing
CO-5	Understand borehole problems
Course Code: 201AM611	
Course Title: THEORY OF MACHINES LAB	
CO-1	Evaluate performance of a Hartnel Governor
CO-2	Determine the frequencies of vibration in case of free and forced vibrations of a spring-mass system
CO-3	Determine motion Characteristics of a slider crank mechanism and cam- follower mechanism
CO-4	Demonstrate various mechanical power transmission devices/components like screw jack and gears
Course Code:201AM612	
Course Title: VEHICLE MAINTENANCE LAB	
CO-1	Acquire the fundamental knowledge in evaluation and maintenance
CO-2	Understand the various methods of maintaining vehicles and their subsystems
CO-3	Estimate the maintenance charges
CO-4	Understand equipment required for maintenance shop
CO-5	Identify required skills of the workers and number of workers
Course Code: 201AM613	
Course Title: HEAT TRANSFER LAB	
CO-1	Evaluate the conduction, convection and radiation heat transfer and their applications in real life
CO-2	Analyze the problems involving steady state and transient heat conduction in simple geometries
CO-3	Evaluate heat transfer coefficients for natural convection and forced convection
CO-4	Estimate the LMTD of heat Exchanger
CO-5	Evaluate the Stefan Boltzmann constant and emissivity of different bodies in radiation
Course Code: 201AM681	
Course Title: ACCIDENT ANALYSISLAB	
CO-1	The student can analyze the nature of accident caused

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CO-2	The student can identify the causes of Accidents
CO-3	The student can estimate the repair charges of the vehicle damage caused by the accident
CO-4	The student can suggest solutions to stop the accidents
CO-5	The student can illustrate technical solutions to avoid particular accidents
Course Code: 201HB691	
Course Title: QUANTITATIVE APTITUDE AND REASONING	
CO-1	Critically evaluate various real –life situations by resorting to analysis of key issues and factors
CO-2	Represent mathematical information symbolically, visually, numerically, and verbally
CO-3	Demonstrate various principles involved in solving mathematical problems and thereby reducing the
CO-4	Improve speed and accuracy in solving problems by using quicker methods
CO-5	Identify recurring and missing patterns in a sequence, which in turn help sin enhancing deductive ability
Course Code:201AM761A	
Course Title: METAL CUTTING AND MACHINE TOOLS	
CO-1	Explain the cutting tool geometry, Chip formation and cutting force
CO-2	Describe the various parts and operations of machine tools Viz, Lathe, Shapper, Planner etc.
CO-3	Identify various machine tools Viz, Lathe, Shapper, Planner etc.
CO-4	Discuss various Principles and applications of jigs and Fixtures
CO-5	Explain the working principles of Various Non-Traditional Machining
Course Code: 201AM762C	
Course Title: VEHICLE TRANSPORT MANAGEMENT	
CO-1	Adapt infrastructure required for transport management
CO-2	Organize the transport system in effective way
CO-3	Prevent the accidents
CO-4	Estimate the fare
CO-5	Identify different transport systems and costs involved
Course Code:201AM763C	
Course Title: CAD/CAM	
CO-1	Explain the basic concepts of CAD and Computer graphics
CO-2	Solve the mathematical models to represent various geometries
CO-3	Compose the part programs for engineering components

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CO-4	Explain the concepts of group technology and computer aided quality control
CO-5	Discuss the elements of flexible Manufacturing systems and computer integrated Manufacturing
Course Code:201AM764a	
Course Title: MODERN VEHICLE TECHNOLOGY	
CO-1	Design and develop modern vehicles
CO-2	Design modern suspension systems for automobile safety and comfort
CO-3	Analyze and control the exhaust emissions and noise
CO-4	Analyze the vehicle operation, incorporate and develop the electronic control system
CO-5	Distinguish and choose the fuel injection system
Course Code: 201AM765a	
Course Title: ALTERNATIVE ENERGY RESOURCES FOR AUTOMOTIVES	
CO-1	Produce and use alternative fuels
CO-2	Determine and predict properties, performance, emission characteristics of alternate fuels
CO-3	Judge the effect of alternative fuels on fossil fuels
CO-4	Design, Analyze and build the electric and hybrid automobiles
CO-5	Understand working of fuel cell and solar cars
Course Code:201AM781	
Course Title: ADDITIVE MANUFACTURING	
CO-1	Develop STL file for CAD models with appropriate support and orientation
CO-2	Build complex engineering assemblies in plastic material with minimum build time
CO-3	Evaluate the process parameters of AM machine to improve the quality of parts produced
CO-4	Model and fabricate working models using AM Processes

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GR-20 B.Tech Mining Engineering

Department Vision: To be recognized as a National Centre of Excellence in Mining Engineering to cope with the challenges of sustainable development in Mining industry.

Department Mission:

1. To provide high quality Programmes supported by up-to- date curriculum and practical courses.
2. We prepare students to understand eco-friendly and sustainable development in mining industry.
3. Extensive practical courses to foster learning by observation.
4. Exposing students to various mining projects to reinforce their classroom / laboratory learning.
5. Sensitization towards ethical, social responsibilities, leadership, entrepreneurship, communication skills and lifelong learning.

Program Educational Objectives(PEOs):

PEO1	Plan and design mine project operations
PEO2	Apply engineering skills/techniques to manage mining operations effectively and able to solve Mining engineering problems..
PEO3	Be able to design/execute all project operations of surface and underground mining projects in an eco-friendly manner. .

Program Specific Outcomes(PSO's):

PSO1	Ability to pursue higher education and research.
PSO2	Develop strong skills in systematic planning, developing, implementing in different domains for betterment of life
PSO3	Plan and operate mining projects by using various engineering/technological tools to meet the volatile needs of the industry.
PSO4	Advance themselves professionally and personally by accepting professional and social responsibilities and pursuing leadership roles.

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Program Outcomes (POs) : Engineering Graduates will be able to :

1	Apply skills/techniques to solve the problems of projects.
2	Critically analyze and interpret the data to solve project problems
3	Plan and design the mine layouts to evaluate the project performance and productivity.
4	Manage & execute the project plans to meet goals of economic, environmental, social, political, ethical, health and safety.
5	Apply latest skills/techniques of computer software, modern instrumentation, novel technologies in engineering activities.
6	Comprehend the efficiency of mines, allied industries and suggest solutions in improving the economics, safety and optimization.
7	Comprehend the professional and ethical values.
8	Comprehend need for higher learning and engage in life-long learning.
9	Make effective communication in verbal and written forms with confidence.
10	Demonstrate leadership in project planning/ execution to obtain quality and quantity.
11	Demonstrate teamwork with other teams of inter-disciplinary department
12	Excel and improvise their skills under challenging circumstances at their projects.

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Course outcomes (Cos) of all courses of all programs offered by the institution

Course outcomes for First Year First Semester Course	
Course Code: 201HB101	
Course Title: Mathematics - I	
CO1:	Transform the knowledge of solving system of linear equations using matrices.
CO2:	Evaluate nature of the Quadratic form.
CO3:	Acquire the knowledge maxima and minima of function of several variables.
CO4:	Evaluate multiple integrals and their applications.
CO5:	Understand and apply vector derivatives and vector integration theorems.
Course Code: 201HB102	
Course Title: Communicative English-I	
CO1:	Develop effective reading strategies
CO2:	Demonstrate writing skills that are required for professional development and use graphic elements for communication.
CO3:	Apply grammatical skills and vocabulary effectively in speech and writing
CO4:	Display language efficacy in tune with subjective knowledge
CO5:	Use required language along with contextual vocabulary and grammar structures
Course Code: 201HB103b	
Course Title: Engineering Chemistry	
CO1:	Understand the removal techniques of hardness of water
CO2:	Distinguish the fuel cells and batteries
CO3:	Identify different control techniques of corrosion
CO4:	Understand the concepts of plastics and rubbers
CO5:	Analyse the importance of nanomaterials.
Course Code : 201EE104	
Course Title: Basic Electrical and Electronics Engineering	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation of DC machines,3-point starter and conduct the Swinburne's Test.
CO3:	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.
Course Code: 201ME105	
Course Title:Engineering Graphics	
CO1:	Apply principles of drawing to represent dimensions of an object.
CO2:	Outline the polygons and engineering curves.
CO3:	Illustrate projections of points, lines, planes and solids.
CO4:	Illustrate the 3D views through isometric views.
CO5:	Create the isometric views and orthographic views
Course Code: 201HB111b	
Course Title: Engineering Chemistry Laboratory	
CO1:	Explain the functioning of the instruments such as pH, conductivity, and potentiometric meters.
CO2:	Determine the total hardness of water
CO3:	Perform various redox titrations.
CO4:	Preparation of polymers
CO5:	Compare viscosities of different oils
Course Code: 201EE112	
Course Title:Basic Electrical and Electronics Engineering Laboratory	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation or DC machines,3 -point starter and conduct the Swinburne's Test.
CO3:	Analyze the performance oi transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.

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CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.
Course Code: 201ME113d	
Course Title:Basic Engineering Workshop	
CO1:	Experiment with various basic house wiring techniques.
CO2:	Develop basic prototype in the trade of tin smithy such as square tray and open scoop.
CO3:	Design v-fitting and square fitting in the trade of fitting
CO4:	Making square rod and L-bend from the round rod in black smithy
CO5:	Build various prototype like T lap joint, dovetail joint, cross lap etc. in the trade of carpentry.

Course outcomes for First Year Second Semester Course	
Course Code: 201HB201	
Course Title: Mathematics – II	
CO1:	Solve first order differential equations.
CO2:	Solve higher order differential equations with constant coefficients
CO3:	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems.
CO4:	Understand numerical differentiation and integration.
CO5:	Apply the knowledge of different algorithms for approximating the solution of ordinary differential equations in practical engineering problems.
Course Code: 201HB202b	
Course Title: Engineering Physics	
CO1:	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution. To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics
CO2:	To assess the electromagnetic wave propagation in different media and its power and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors.
CO3:	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.
CO4:	To interpret dielectric loss, Lorentz field and Claussius - Mosotti relation and classify the magnetic materials based on susceptibility and their temperature dependence. To apply the Gauss' Theorem for divergence and Stokes' theorem for curl and evaluate Maxwell's displacement current and correction in Ampere's law.
Course Code: 201ME203a	
Course Title: Engineering Mechanics	
CO1:	Carry out composition of system of forces.
CO2:	Analyse rigid bodies in static equilibrium condition under system of forces including friction.
CO3:	Determine centre of gravity and moment of inertia of simple and composite planar, solid sections.
CO4:	Carry out dynamic analysis of rigid bodies under translation, rotation and plane motion.
CO5:	Apply work energy and impulse momentum principles to rigid body motion.
Course Code: 201CS204a	
Course Title: Fundamentals of Computer Programming	
CO1:	Students will acquire a strong grasp of the C programming language, including its syntax, data types, control structures, functions, and pointers
CO2:	Algorithmic Thinking and Problem-Solving Skills
CO3:	Debugging and Troubleshooting
CO4:	The course will introduce students to fundamental data structures, such as arrays, linked lists, stacks, and queues
CO5:	Application Development: Students will gain practical experience in developing C-based applications

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Course Outcomes for Second Year First Semester Course	
Course Code:201MM302	
Course Title: Mine Development	
CO-1	Infer the role of mining in economic development, various unit operations in mining
CO-2	Gain exposure in various modes of mine access in underground and opencast mining
CO-3	Summarize the methods and various factors affecting shaft sinking operation in mining
CO-4	Compare various drilling mechanisms
CO-5	Identify various types of explosive..
Course Code:201MM303	
Course Title: Mine surveying	
CO-1	Measure relative positions of objects below or above the earth surface .
CO-2	Identify the parts of surveying instruments and calculate horizontal, vertical angles
CO-3	Evaluate the elevation of field objects and contour intervals
CO-4	Perform using plane table surveying
CO-5	Utilize modern surveying techniques in field
Course Code: 201MM304	
Course Title: Mining Geology	
CO-1	Outline the engineering concepts of geological and hydrological elements
CO-2	Classify processes of ore minerals formations, origin, occurrence and uses
CO-3	Infer the basic attribute geology
CO-4	Relate economic viability of mineral
CO-5	Summarize various prospecting methods for mineral deposit.
Course Code: 201MM305	
Course Title: Mining Machinery	
CO-1	Compare the operations an application of conveyors
CO-2	Plan and design the pumping system of a mine
CO-3	Plan the electrical and telecommunication system in mines .
CO-4	Identify the operations and applications of surface mining equipment
CO-5	Assess the operations and application of machinery in underground mines
Course Code: 201MM311	
Course Title: Mine Surveying Laboratory	
CO-1	Measure relative positions of objects below or above the earth surface
CO-2	Identify the parts of surveying instruments and calculate horizontal, vertical angles.
CO-3	Evaluate the elevation of field objects and contour intervals
CO-4	Perform using plane table surveying
CO-5	Utilize modern surveying techniques in field
Course Code:201MM312	
Course Title: Mining Geology Laboratory	
CO-1	Observe and analyse the Geo-morphology and geological structure of a particular area
CO-2	Measure attitude of bed using physical properties
CO-3	Examine the mineral physical properties
CO-4	Identify the megascopic properties of rocks
CO-5	Categorize the geological formations

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Course Code:201MM313	
Course Title: Mining Machinery Laboratory	
CO-1	Identify various wire ropes used in mines
CO-2	Plan transport systems and safety devices
CO-3	Demonstrate gate end box and various cables used mines
CO-4	Plan and design different types of support systems
CO-5	Distinguish different types of support systems

Course Outcomes for Second Year Second Semester Course	
Course Code: 201MM401	
CourseTitle: Mineral Processing	
CO-1	Classify various sampling methods..
CO-2	Comprehend and explain the settling of solids.
CO-3	Appraise the beneficiation process and its applications.
CO-4	Appraise the beneficiation process and its applications.
CO-5	Comprehend and analyze the efficiency of operations in mineral processing industries.
Course Code: 201MM402	
Course Title: Advance mine surveying	
CO-1	Understand the basics of Tachometric survey.
CO-2	Set out curves by using various surveying methods and instruments
CO-3	Measure the areas and volumes by using various surveying methods.
CO-4	Measure the areas and volumes by using various surveying methods.
CO-5	Correlate surface, underground survey and stop survey
Course Code: 201MM403	
Course Title: Surface Mining	
CO-1	Differentiate various systems of surface mining and their applications
CO-2	Design the opening up of the deposits and Bench formations.
CO-3	Compare various excavating and loading equipment
CO-4	Formulate the production capacities of various HEMM.
CO-5	Apply fundamental principles to the design and selection of safe and efficient blasting.
Course Code: 201MM404	
Course Title: Underground Coal Mining	
CO-1	Infer the factors influencing choice of mining methods and possible entries.
CO-2	Perform the development and depillaring operations in bord and pillar mining
CO-3	Summarize the development and extraction using long wall mining method
CO-4	valuate different challenges associated with thick seam mining
CO-5	Plan the extraction of coal using modern mining methods.
Course Code: 201MM405	
Course Title: Mine Systems Engineering	
CO-1	Solve the real-life problems on Linear programming and allocation.
CO-2	Comprehend the transportation, assignment, sequencing and replacement concepts
CO-3	Comprehend the concept of games, waiting lines

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CO-4	Comprehend the transportation, assignment, sequencing and replacement concepts.
CO-5	Comprehend the transportation, assignment, sequencing and replacement concepts
Course Code: 201MM413	
Course Title: Engineering Geology Laboratory	
CO-1	Interpret the topographic map, geological map, Structural Geological maps of India
CO-2	Infer geological time scale
CO-3	Evaluate mineral in detail by microscopic study.
CO-4	Summarize the crystallography concepts of minerals in an area.
CO-5	Summarize the crystallography concepts of minerals in an area.
Course Code: 201MM411	
Course Title: Mineral Processing Laboratory	
CO-1	Comprehend the selection of mineral samples by different methods..
CO-2	Identify and comprehend the process of separation of mineral particles.
CO-3	Determine the size distribution of mineral particles using various techniques.
CO-4	Comprehend and verify the comminution laws.
CO-5	Determine the critical speed of the ball mill
Course Code: 201MM412	
Course Title: Advanced Mine Surveying Laboratory	
CO-1	Understand the basics of Tachometric survey.
CO-2	Set out curves by using various surveying methods and instruments.
CO-3	Set out curves by using various surveying methods and instruments.
CO-4	Design the mine plans by using various methods.
CO-5	Correlate surface, underground survey and stop survey.

Course Out comes for Third Year First Semester Course	
Course Code: 201MM501	
Course Title: Mine Planning and Design	
CO-1	Comprehend and plan different stages in new mines.
CO-2	Analyse and prepare different plan reports.
CO-3	Interpret the design, planning of ventilation and infrastructure in mines.
CO-4	Analyse the concept of open-pit design.
CO-5	Comprehend the process of mine reclamation, rehabilitation, and corporate social responsibility
Course Code: 201MM502	
Course Title: Mine Ventilation	
CO-1	Comprehend the mine atmosphere, monitoring, and its control
CO-2	Comprehend the mine atmosphere, monitoring, and its control
CO-3	Comprehend the mine atmosphere, monitoring, and its control
CO-4	Interpret and perform the mine ventilation survey.
CO-5	Design a ventilation network

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Course Code: 201MM503	
Course Title: Underground Metal Mining	
CO-1	Comprehend the terminology used in underground metal mining, their scope and limitation
CO-2	Comprehend the terminology used in underground metal mining, their scope and limitation
CO-3	Summarize the raising methods used in underground metal mining.
CO-4	Summarize the raising methods used in underground metal mining.
CO-5	Discuss different special stoping methods, their applicability with limitations.
Course Code: 201MM564A	
Course Title: Geostatistics(Professional Elective-1)	
CO-1	Comprehend the schools of Geostatistics, estimation models for mine evaluation
CO-2	Interpret semi-variogram and co-variogram.
CO-3	Interpret semi-variogram and co-variogram.
CO-4	Analyze the integrated geological-geostatistical system.
CO-5	Identify the geostatistical applications
Course Code 201MM564B	
Course Title: Mine Transportation (Professional Elective-1)	
CO-1	Assess the principles, operations and application of conveyors..
CO-2	Demonstrate different types of rope haulage and its application.
CO-3	Identify various locomotive haulage systems
CO-4	Demonstrate various types of winding systems in mine
CO-5	Comprehend skip and koepe winding in mines.
Course Code: 201MM564C	
Course Title: Mine Management(Professional Elective-1)	
CO-1	Comprehend and practice mine management aspects.
CO-2	Appraise the importance of personal management and human relations
CO-3	Perform work study environment and comprehend operation management
CO-4	Outline the concepts of behavioral sciences for management.
CO-5	comprehend the principles of maintenance and marketing management.
Course Code: 201MM564D	
Course Title: Rock Excavation(Professional Elective-1)	
CO-1	Comprehend the rock breaking theory.
CO-2	Summarize rock properties related to rock excavation.
CO-3	Appraise the technology used in rock cutting
CO-4	Classify various rock cutting tools and their applications
CO-5	Compare various rock excavating machines
Course Code: 201MM511	
Course Title: Mine Planning and Design Lab	
CO-1	Comprehend and plan different stages in new mines..
CO-2	Analyse and prepare different plan reports.
CO-3	Interpret the design, planning of ventilation and infrastructure in mines.
CO-4	Analyse the concept of open-pit design.
CO-5	Calculate the production obtained by using various machinery in mines.

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Course Code: 201MM512	
Course Title: Mine Ventilation Lab	
CO-1	Comprehend the mine atmosphere, monitoring and its control.
CO-2	Evaluate the various mine heat sources and cooling system in mines.
CO-3	Compare different types of natural and mechanical ventilation systems
CO-4	Interpret and perform the mine ventilation survey
CO-5	Perform the tests using various flame safety lamps.
Course Code: 201MM665a	
Course Title :open pit slope analysis and design (open elective - II)	
CO-1	Classify various modes of slope failure.
CO-2	Comprehend and analyse the geotechnical parameters required for slope stability analysis.
CO-3	Interpret the shear strength of intact rock mass and jointed rock mass
CO-4	Analyse the flow of water in slope stability.
CO-5	Summarize various methods and techniques used to assess the slope stability
Course Code:201MM764a	
Course Title: Mining and its importance (open elective - III)	
CO-1	Understand the role of mining industry for development of nation.
CO-2	Classify the coal mining methods.
CO-3	Understand the concepts of metal mining. .
CO-4	Assess the sustainable mining practices in India and abroad.
CO-5	Summarize the applications of different sensors for mining industry
Course Code:201MM765a	
Course Title: Remote Sensing & GIS in mining (open elective - IV)	
CO-1	Outline the basic principles of Remote Sensing.
CO-2	Develop the concepts of visual and digital image analysis.
CO-3	Summarize the basic concepts of GIS.
CO-4	Perform spatial analysis.
CO-5	Apply knowledge of remote sensing and GIS in various fields
Course Code: 201CS213a	
Course Title: Fundamentals of Computer Programming Laboratory	
CO1:	Students will acquire a strong grasp of the C programming language, including its syntax, data types,
CO2:	Algorithmic Thinking and Problem-Solving Skills
CO3:	Debugging and Troubleshooting
CO4:	The course will introduce students to fundamental data structures, such as arrays, linked lists, stacks,
CO5:	Application Development: Students will gain practical experience in developing C-based applications
Course Code: 201HB296	
Course Title: Environmental Studies	
CO1:	Gain a higher level of personal involvement and interest in understanding and solving environmental problems
CO2:	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and development activities
CO3:	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO4:	Recognize the interconnections of human dependence on the earths ecosystems
CO5:	Influence their society in proper utilization of goods and services

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Course Out comes for Third Year Second Semester Course	
Course Code: 201MM601	
Course Title: Computer Applications in Mining	
CO-1	Identify use of computers and software in exploration ,blasting, ground vibration,subsidenceetc
CO-2	Summarize various numerical methods and their applications in mining.
CO-3	Outline different tools and techniques like LIDAR and communication systems used in mines
CO-4	Comprehend various numerical modeling methods used in mining
CO-5	Relate computer applications in ventilation and strata monitoring
Course Code: 201MM602	
Course Title: Mine Legislation and General Safety	
CO-1	Outline the history of mining legislation in India
CO-2	Outline the history of mining legislation in India
CO-3	Illustrate the Mine rules, Rescue Rules and MVT Rules
CO-4	Summarize the National Coal Wage Agreement and CMPF Act.
CO-5	Outline the general safety aspects in mining
Course Code: 201MM603	
Course Title: Rock Mechanics	
CO-1	Appraise the importance of rock mechanics and physio-MINING properties of rock
CO-2	Analyse the stress-strain in rocks.
CO-3	Outline insitu stress measurement techniques and geophysical investigation methods
CO-4	Differentiate among various rock mass classifications and rock failure criterion.
CO-5	Analyse the various modes of slope failure and its stabilization techniques.
Course Code: 201MM664A	
Course Title: Environmental Impact Assessment in Mines(Professional Elective-2)	
CO-1	Comprehend the concept of environmental impact assessment.
CO-2	Assess the types and limitations of environmental impact assessment..
CO-3	Identify the components of environmental impact assessment.
CO-4	Predict the impacts of environmental impact assessment.
CO-5	Appraise the statutory requirement for mine environment management.
Course Code: 201MM664B	
Course Title: Innovative Mining Systems (Professional Elective-2)	
CO-1	Comprehend and analyze the technological life cycle of mining operations.
CO-2	Appraise the basics of system dynamics involved in innovative mining systems
CO-3	Comprehend the new developments in mining operations
CO-4	Apprehend the new frontiers of mining in real world.
CO-5	Design and introduce automation and robotics in mining operation.
Course Code: 201MM664C	
Course Title: .Mine Construction Engineering (Professional Elective-2)	
CO-1	Outline the geological investigations in mine
CO-2	Comprehend the laying out of shaft lining
CO-3	Appraise the design and construction of insets.
CO-4	Comprehend the mechanization of underground operations.
CO-5	Appraise the design and construction of surface infrastructure.

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GRBT-20 B.Tech CSM

Vision

To facilitate the highest quality data science education, research and having collaborations in the public and private sectors for preparing the next generation of data scientists and researchers for a data-centric world by bringing together interdisciplinary faculty

MISSION

Take steps towards innovating new and better tools to continuously improve how organizations gather, curate, visualize, interpret, and utilize data

- Provide best education and training opportunities.
- Build relationships with industry, government, philanthropic, and community connections.
- Establish specialized laboratories and research infrastructure matching to the best in the nation.
- Give emphasis on solving problems of interdisciplinary nature involving data science and by involving interdisciplinary faculty.

Program Educational Objectives (PEOs):

PEO1	Graduates of the program can have a globally competent skilled career in information Science domain.
PEO2	To prepare students to surpass in knowledge Science with the technical skills and competence to hold out analysis and address basic wants of the society.
PEO3	Graduates of the program can have bourgeois skills with a womb-to-tomb learning angle so as to support the expansion of economy of a rustic.

Program Specific Outcomes (PSO's):

PSO1	To spot, formulate and solve real world complicated engineering issues visage in industries and /or throughout analysis work with due thought for the general public health and safety, within the context of cultural, societal, and environmental things.
PSO2	An ability to style and develop information Science strategies for analyzing huge datasets.

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Program Outcomes (POs): Engineering Graduates will be able to:

1	Apply fundamental knowledge of Science, Mathematics and Engineering principles in solving problems related to Mechanical Engineering.
2	Apply principles of design engineering, thermal engineering, production engineering and industrial engineering to arrive at a physically meaningful analysis of engineering problems.
3	Present feasible designs for simple domestic and industrial Mechanical Engineering problems through drawings and other multimedia tools to meet desired needs.
4	Identify, formulate and solve Mechanical engineering problems through rigorous research methodology.
5	Use Drafting, Modeling and Analysis Software and/or hardware tools for meaningful and economically viable Engineering practice.
6	Apply knowledge of Thermal, Design, Automation Technologies and Management principles to inter-disciplinary engineering problems and their societal implications.
7	Understand and propose, where ever possible, environment-friendly and sustainable solutions to Mechanical Engineering problems.
8	Expertise in following ethical code of conduct in professional activities.
9	Use their analytical, teamwork, leadership skills in the development of products and provide solutions to problems sought by local and/or global community.
10	Communicate verbally, textually and graphically to collaborate effectively towards engineering activities
11	Inspire confidence in team members to realize the goals of the organization and manage finances an sizeable projects by choosing the right blend of common sense solutions.
12	Develop confidence and a sense of curiosity towards life-long learning to adapt to ever changing technologies.

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Course Out Comes (Cos) of all courses of all programs offered by the Institution

Course outcomes for First Year First Semester Course	
Course Code:201HB101	
Course Title: Mathematics - I	
CO1:	Transform the knowledge of solving system of linear equations using matrices.
CO2:	Evaluate nature of the Quadratic form.
CO3:	Acquire the knowledge maxima and minima of function of several variables.
CO4:	Evaluate multiple integrals and their applications.
CO5:	Understand and apply vector derivatives and vector integration theorems.
Course Code: 201HB102	
Course Title: Communicative English-I	
CO1:	Develop effective reading strategies
CO2:	Demonstrate writing skills that are required for professional development and use graphic elements for communication.
CO3:	Apply grammatical skills and vocabulary effectively in speech and writing
CO4:	Display language efficacy in tune with subjective knowledge
CO5:	Use required language along with contextual vocabulary and grammar structures
Course Code: 201HB103b	
Course Title: Engineering Chemistry	
CO1:	Understand the removal techniques of hardness of water
CO2:	Distinguish the fuel cells and batteries
CO3:	Identify different control techniques of corrosion
CO4:	Understand the concepts of plastics and rubbers
CO5:	Analyse the importance of nanomaterials.
Course Code:201CS104	
Course Title: Problem Solving & Programming in C	
CO1:	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO2:	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.

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CO3:	Develop program by using Control structure, different looping and Jump statement.
CO4:	Implement applications of Array, Structure and String inside the program. Also acquire the knowledge of different FILE operations.
CO5:	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.
Course Code: 201ME105	
Course Title:Engineering Graphics	
CO1:	Apply principles of drawing to represent dimensions of an object.
CO2:	Outline the polygons and engineering curves.
CO3:	Illustrate projections of points, lines, planes and solids.
CO4:	Illustrate the 3D views through isometric views.
CO5:	Create the isometric views and orthographic views
Course Code: 201HB111b	
Course Title: Engineering Chemistry Laboratory	
CO1:	Explain the functioning of the instruments such as pH, conductivity, and potentiometric meters.
CO2:	Determine the total hardness of water
CO3:	Perform various redox titrations.
CO4:	Preparation of polymers
CO5:	Compare viscosities of different oils
Course Code: 201CS112	
Course Title:Problem Solving & Programming in C Lab	
CO1:	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO2:	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO3:	Develop program by using Control structure, different looping and Jump statement.
CO4:	Implement applications of Array, Structure and String inside the program. Also acquire the knowledge of different FILE operations.
CO5:	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.
Course Code:201ME113c	
Course Title:Computer Engineering Workshop	
CO1:	Assemble and disassemble components of a PC
CO2:	Construct a fully functional virtual machine, Summarize various Linux operating system commands,
CO3:	Recognize characters & extract text from scanned images, Create audio files and podcasts

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Course outcomes for First Year Second Semester Course	
Course Code:201HB201	
Course Title: Mathematics – II	
CO1:	Solve first order differential equations.
CO2:	Solve higher order differential equations with constant coefficients
CO3:	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems.
CO4:	Understand numerical differentiation and integration.
CO5:	Apply the knowledge of different algorithms for approximating the solution of ordinary differential equations in practical engineering problems.
Course Code:201HB202a	
Course Title: Applied Physics	
CO1:	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution.
CO2:	To demonstrate the concept on the absorption and spontaneous and stimulated emission in two level system and the conditions for laser amplification and explain the working principle of optical fibers and
CO3:	To study the Schrödinger equation for standard systems with both analytical and numerical methods, and then interpret the results. And to explain the physical states of elementary particles and atoms in
CO4:	To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors
Course Code: 201EC203	
Course Title: Fundamentals of Digital Electronics	
CO1:	Understand various number systems, conversions, range and error detecting and Correcting codes and their significance.
CO2:	Evaluate the minimization of logic gates using Boolean algebraic principles.
CO3:	Evaluate the minimization of Boolean algebra using K-maps.
CO4:	Design various simple and complex combinational circuits with real time applications.
CO5:	Analyze the basic principles behind Flip flops and the design of sequential circuits with real time applications.
Course Code:201CS204	
Course Title: Data Structures	
CO1:	To be able to choose appropriate data structure as applied to specified problem definition.
CO2:	To be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
CO3:	To be able to apply concepts learned in various domains like DBMS, compiler construction.
CO4:	To be able to use linear and non-linear data structures like stacks, queues, linked list etc.
Course Code:201CS205	
Course Title: Python Programming	
CO1:	Handle different data structures..

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CO2:	understand the use of control statements, function overloading, operator overloading in real time application
CO3:	Implement files using various file operations.
Course Code:201HB296	
Course Title: Environmental Science	
CO1:	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO2:	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO3:	Demonstrate knowledge relating to the biological-systems involved in the major global environmental problems of the 21st century
CO4:	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO5:	Influence their society in proper utilization of goods and service
Course Code:201HB211a	
Course Title: Applied Physics Laboratory	
CO1:	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution.
CO2:	To demonstrate the concept on the absorption and spontaneous and stimulated emission in two level system and the conditions for laser amplification and explain the working principle of optical fibers and
CO3:	To study the Schrödinger equation for standard systems with both analytical and numerical methods, and then interpret the results. And to explain the physical states of elementary particles and atoms in
CO4:	To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors
CO5:	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution.
Course Code:201HB212	
Course Title: Communicative English Lab	
CO1:	Learn to communicate in English
CO2:	Comprehend native speaker's accent
CO3:	Speak appropriately in real life situations
CO4:	Display public speaking skills in the required context
CO5:	Handle different communicative situations
Course Code:201CS213	
Course Title: Data Structures Lab	
CO1:	Write the programs for mathematical functions using python programming language.
CO2:	Write programs for object oriented concepts and data structures.
CO3:	Choose appropriate data structure as applied to specified problem definition.

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CO4:	Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
CO5:	Apply concepts learned in various domains like DBMS, compiler construction etc.
CO6:	Use linear and non-linear data structures like stacks, queues, linked list etc.

Course Outcomes for Second Year First Semester Course	
Course Code:201CS302	
Course Title: Design and Analysis of Algorithms	
CO1:	Analyze best and worst-case running times of algorithms
CO2:	Describe various algorithm design situation
CO3:	Design engineering problems
CO4:	Applying backtracking techniques in designing algorithms
CO5:	Applying branch and bound and NP completeness techniques in general problems.
Course Code: 201AI303	
Course Title: Database Management Systems	
CO1:	Define a Database Management System
CO2:	Give a description of the Database Management structure and applications of Databases
CO3:	Know the advantages and disadvantages of the different models
CO4:	Compare relational model with the Structured Query Language (SQL)
CO5:	Know the constraints and controversies associated with relational Database model. know the rules guiding transaction ACID
Course Code:201CS304	
Course Title: Object Oriented Programming through JAVA	
CO1:	Learn the structure of Java Program and its applications
CO2:	Develop a software/application using Java Programming language
CO3:	Synthesize the give problem and implement it in Java
CO4:	Choose an engineering approach to solve problems using Java
CO5:	Develop interactive programs using applets.
Course Code:201HB305	
Course Title: Managerial Economics and Financial Analysis	
CO1:	Evaluate the economic theories, cost concepts and pricing policies
CO2:	Understand the market structures and integration concepts

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CO3:	Understand accounting systems and analyze financial statements using ratio analysis
CO4:	Understand the measures of national income, the functions of banks and concepts of Globalization
CO5:	Apply the concepts of financial management for project appraisal
Course Code:201AI311	
Course Title: Database Management Systems Lab	
CO1:	Create Database tables incorporating various constraints.
CO2:	Access the Database using Queries and sub-Queries.
CO3:	Implement PL/SQL Programs, Cursors and Triggers.
CO4:	Apply Normalization to the database tables.
CO5:	Create Database tables incorporating various constraints.
Course Code: 201CS312	
Course Title: Object Oriented Programming through JAVA Lab	
CO1:	Write programs for solving real world problems using java collection frame
CO2:	Write programs using abstract classes
CO3:	Write multithreaded programs
CO4:	Write GUI programs using event handling in Java
CO5:	Write programs using applet.
Course Code: 201CS313	
Course Title: Linux and Shell Programming Lab	
CO1:	Ability to understand the Linux environment.
CO2:	Understand the basic command of Linux operating systems and write shell scripts
CO3:	Ability to perform the file management and multiple tasks using shell
CO4:	Write programs on important Linux library functions and system calls.
CO5:	Apply administrative functions on Linux operating system
Course Code: 201CS381	
Course Title: Web Application Development Using Full Stack Module -1	
CO1:	Analyze a webpage and identify its element and attributes.
CO2:	Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Styles heet
CO3:	Implement MVC and responsive sign to scale well across PC, Tablet and Mobile Phone

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CO4:	Create web pages using HTML and Cascading Style Sheets.
CO5:	Develop websites with HTML and CSS
Course Code: 201CE391	
Course Title: CONSTITUTION OF INDIA	
CO1:	Understand historical background of the constitution making and its importance Building a democratic India.
CO2:	Understand the functioning of three wings of the government ie., executive, legislate and judiciary.
CO3:	Understand the value of the fundamental rights and duties for becoming good citizen India.
CO4:	Analyze the decentralization of power between central, state and local self-governme t
CO5:	Apply the knowledge in strengthening of the constitutional institutions like CA

Course Outcomes for Second Year Second Semester Course	
Course Code: 201CS401	
Course Title: Statistics with R Programming	
CO1:	Install Code and Use R Programming Language in R Studio IDE to perform basic tasks on Vectors, Matrices and Data frames.
CO2:	Describe key terminologies, concepts and techniques employed in Statistical Analysis.
CO3:	Define, Calculate, Implement Probability and Probability Distributions to solve a wide variety of problems
CO4:	Conduct and interpret a variety of Hypothesis Tests to aid Decision Making
CO5:	Understand Analyze, Interpret Correlation and Regression to analyze the underlying relationships between different variables.
Course Code:201CS401	
Course Title: Formal Languages and Automata Theory	
CO1:	Classify machines by their power to recognize languages
CO2:	Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
CO3:	Employ finite state machines to solve problems in computing
CO4:	Illustrate deterministic and non-deterministic machines
CO5:	Quote the hierarchy of problems arising in the computer science
Course Code:201AI403	
Course Title: Computer Organization	
CO1:	Represent the data in various formats

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CO2:	Perform various register operations
CO3:	Organize and design a computer system
CO4:	Perform logic operations and operations on microprocessors.

Course Code:201DS404	
Course Title: Data Science for Engineers	
CO1:	Understanding of the fundamental concepts and tools of data science, including linear algebra, probability theory, statistics, and optimization.
CO2:	Ability to apply structured thinking techniques for solving data science problems.
CO3:	Knowledge and skills to acquire, clean, pre-process, and manage data for analysis.
CO4:	Competence in performing regression analysis, classification, and clustering using various data science methods.
CO5:	Familiarity with optimization techniques used in machine learning.
Course Code:201CS405	
Course Title: Software Engineering	
CO1:	Choose the type of life cycle model for developing the project
CO2:	Gather the appropriate requirements for the development process
CO3:	Make proper design and architecture for the development process based on requirements
CO4:	Code the project using basic principles and test it using various testing methodologies
CO5:	Maintain the project using various types of maintenance.
Course Code:201CS411	
Course Title: R Programming Lab	
CO1:	Install R studio and R console and import various packages.
CO2:	Perform calculations on basic mathematical operations.
CO3:	Implement basic concepts of R programming, and its different module that includes lists, Strings, Functions, Frames, Arrays.
CO4:	Importing the CSV files and performs operations.
CO5:	Implement the various statistical techniques using R.
Course Code:201DS412	
Course Title: Fundamentals of Data Science Lab	
CO1:	Perform various operations onnumpy arrays
CO2:	Importing data from different file formats using pandas
CO3:	Draw different types of charts using mat plot lib

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Course Code: 201AI413	
Course Title: Software Engineering Lab	
CO1:	Analyze and specify software requirements through a productive working relationship with various stakeholders of the project
CO2:	Prepare SRS document, design document, test cases and software configuration management and risk management related document.
CO3:	Develop function oriented and object-oriented software design using tools like rational rose.
CO4:	Use modern engineering tools necessary for software project management, estimations, time management and software reuse
CO5:	Generate test cases for soft ware testing
Course Code: 201CS481	
Course Title: Web Application Development Using Full Stack Module -2	
CO1:	Develop of the major Web Application Tier-Client side development.
CO2:	Participate in the active development to cross- browser applications through Java Script.
CO3:	Develop Java Script applications that transition between states.
CO4:	Describe and utilize JavaScript programming concepts such as variables, arrays, conditionals, and loops.
CO5:	Deploy JavaScript code to solve practical web design problems.

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1.1.1: Curricula developed and implemented have relevance to the local, regional, national, and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes(COs) of the Programmes offered by the institution



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PEOs, PSOs & COs

GRBT-19 B.Tech (Civil Engineering)

Department Vision:

To be the best Civil Engineering department in the region by means of good teaching, research and consultancy that serves the society.

Department Mission:

- Arranging field visits, guest lectures and interactive sessions with subject experts
- Creating a strong bond between industrial needs and academic research outcomes
- Undertaking collaborative projects which offer opportunities for long-term interaction between academia and industry
- Promoting the career of the faculty members by encouraging their research work
- Adopting best teaching practices, imparting employability skills and empowering to become entrepreneurs in the trade.

Program Educational Objectives (PEOs):

PEO1	Learning new technologies and/or undertaking higher education.
PEO2	Leading a team of engineers in executing projects.
PEO3	An entrepreneur in civil engineering community and/or a leadership role exhibiting systematic approach to resolve societal problems with ethical values.

Program Educational Objectives (PSOs):

PSOs	• PSO1: Get proficiency in management and communication skills to become an entrepreneur. • PSO2: Ability to use earth sciences in execution of civil engineering projects.

Program Outcomes (POs): Engineering Graduates will be able to:

- PO-1. Apply knowledge of computing, mathematics, science and engineering basics related to Civil Engineering.
- PO-2. Identify the problems and analyse the solutions by simulating, conducting experiments and interpreting data.
- PO-3 Design civil engineering structures to meet industrial needs.
- PO-4 Explore and investigate contemporary engineering problems and proposed solutions.
- PO-5 Use latest techniques, skills and modern machinery for engineering practices.
- PO-6 Propose civil engineering solutions to solve societal problems.
- PO-7 Design sustainable systems in congruence with social and environmental issues.
- PO-8 Practice professional ethics with legal awareness and societal responsibilities.
- PO-9 Work as an individual or in a team to achieve targets.
- PO-10 Articulate thoughts and ideas effectively at different levels.
- PO-11 Manage financial and human resources for better execution of project.
- PO-12 Participate in lifelong learning process.

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Course outcomes for First Year First Semester Course	
Course Code: 19198101	
Course Title: Mathematics - I	
CO1:	Transform the knowledge of solving system of linear equations using matrices.
CO2:	Apply mean value Rolls, LaGrange's and Cauchy mean value theorem in engineering applications.
CO3:	Acquire the knowledge maxima and minima of function of several variables.
CO4:	Evaluate multiple integrals and their applications.
CO5:	Understand and apply vector derivatives and vector integration theorems.
Course Code: 19198102	
Course Title: Communicative English I	
CO1:	Students will be able to develop effective reading strategies
CO2:	Will be able to demonstrate writing skills that are required for professional development and use graphic elements for communication.
CO3:	Will be able to apply grammatical skills and vocabulary effectively in speech and writing.
Course Code: 19198103	
Course Title: Engineering Chemistry	
CO1:	Compare different types of cells
CO2:	Explain the merits of fuel cells
CO3:	List of various sources of renewable energy
CO4:	Distinguish between polymers and plastics
CO5:	Distinguish between nano clusters & nanowires, polymers.
Course Code: 19198205	
Course Title: Engineering Physics	
CO1:	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution. To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics
CO2:	To interpret dielectric loss, Lorentz field and Clausius- Menotti relation and classify the magnetic materials based on susceptibility and their temperature dependence. To apply the Gauss' Theorem for divergence and Stokes' Theorem for curl and evaluate Maxwell's displacement current and correction in Ampere's law.
CO3:	To assess the electromagnetic wave propagation in different media and its power and explain the working principle of optical fibres and its classification based on refractive index profile and mode of propagation with their applications. To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors.
CO4:	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.
Course Code: 19198212	
Course Title: Engineering Physics Laboratory	
CO1:	To handle optical instruments like microscope and spectrometer, determine thickness of a hair/paper with the concept of interference and to estimate the wavelength and resolving power of different colours using diffraction grating
CO2:	To demonstrate the importance of dielectric material in storage of electric field energy in the capacitors and plot the intensity of the magnetic field of circular coil carrying current with varying distance
CO3:	To evaluate the acceptance angle of an optical fibre and numerical aperture and determine the resistivity of the given semiconductor using four probe method

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CO4:	To identify the type of semiconductor i.e., n-type or p-type using Hall effect and determine the band gap of a given semiconductor
Course Code: 19198111	
Course Title: Communicative English Laboratory	
CO1:	Learning to communicate in English
CO2:	Comprehend native speaker's accent
CO3:	Speak appropriately in real life situations
Course Code: 19198112	
Course Title: Engineering Chemistry Laboratory	
CO1:	Explain the functioning of the instruments such as pH, conductivity and potentiometric meters
CO2:	Determine the total hardness of water
CO3:	Perform various redox titrations
CO4:	Preparation of polymers
CO5:	Compare viscosities of different oils
Course outcomes for First Year Second Semester Course	
Course Code: 19198201	
Course Title: Mathematics – II	
CO1:	Solve first order differential equations.
CO2:	Solve higher order differential equations with constant coefficients
CO3:	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems.
CO4:	Understand numerical differentiation and integration.
CO5:	Apply the knowledge of different algorithms for approximating the solution of ordinary differential equations in practical engineering problems.
Course Code: 19198112	
Course Title: Engineering Chemistry Laboratory	
CO1:	Explain the functioning of the instruments such as pH, conductivity, and potentiometric meters.
CO2:	Determine the total hardness of water
CO3:	Perform various redox titrations.
CO4:	Preparation of polymers
CO5:	Compare viscosities of different oils
Course outcomes for Second Year First Semester Course	
Course Code: 19110302	
Course Title: Strength of Materials	
CO 1:	explain the basic materials behaviour under the influence of different external loading conditions and the support conditions
CO 2:	draw the diagrams indicating the variation of the key performance features like bending moment and shear forces.
CO 3:	calculate the section modulus and determine of stressed developed in the beams due to various loading conditions
CO 4:	assess stresses across section of the thin and thick cylinders to arrive at optimum sections to withstand the internal pressure
CO 5:	determine the forces beams subjected to distributed loads
Course Code: 19110303	
Course Title: Environmental Engineering	

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CO 1:	plan and design the water and distribution networks and sewerage systems.
CO 2:	identify the water source and select proper intake structure.
CO 3:	asses the water quality
CO 4:	select the appropriate appurtenances in the water supply.
CO 5:	select the suitable treatment flow for raw water treatments.
Course Code: 19110304	
Course Title: Construction Materials, Equipment & Management	
CO 1:	describe the types and properties of various building materials -stones, clay products, Timber, metals, cement and concrete and their applications in building industry
CO 2:	list out the various components of buildings.
CO 3:	sketch the various types of stairs and stair cases and their locations, sizes and materials including fire escapes and also lifts and escalators. Describe the various methods of shuttering, scaffolding and centring
CO 4:	describe the various types expansion and construction joints and their construction.
CO 5:	Summarize the importance of construction planning.
Course Code: 19110305	
Course Title: Surveying & Geomatics	
CO 1:	Demonstrate the basic surveying skills
CO 2:	Use various surveying instruments.
CO 3:	Perform different methods of surveying
CO 4:	Compute various data required for various methods of surveying.
CO 5:	Develop the contour map
Course Code: 19110306	
Course Title: Fluid Mechanics	
CO 1:	Define various properties of fluids, state and explain different types of laws and principles of fluid mechanics
CO 2:	Apply Principles of mathematics to represent kinematic concepts related to fluid flow
CO 3:	Derive Euler's Equation of motion and Deduce Bernoulli's equation
CO 4:	Compute force of buoyancy on a partially or fully submerged body and analyse the stability of a floating body.
CO 5:	Measure velocity and rate of flow using various devices
Course Code: 19110397	
Course Title: Constitution of India	
CO 1:	List out the fundamental Rights and Duties
CO 2:	Explain the Union Government and Administrative system
CO 3:	Explain the State Government and Administrative system
CO 4:	Explain the Local Administrative system
CO 5:	Write the role of Election commission
Course Code: 19110311	
Course Title: Building planning and Drawing lab	
CO 1:	Create, display, and plot working drawings
CO 2:	Construct drawings using layer techniques
CO 3:	Construct technical drawings using a standard computer aided drafting program

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CO 4:	evaluate modelling techniques such as edit, zoom, cross hatching, pattern filling, rotation, etc
CO 5:	Use the AutoCAD commands for drawing 2D building drawings required for different civil Engineering applications.
Course Code: 19110312	
Course Title: Materials Testing Laboratory	
CO 1:	Determine the Engineering properties of materials in the laboratory.
CO 2:	Conduct laboratory tests to verify the suitability of the Engineering materials for the given purpose.
CO 3:	Verify the basic principles of behaviour of materials.
CO 4:	Verify the quality of materials through laboratory tests.
CO 5:	Use various materials testing Equipment
Course Code: 19110313	
Course Title: Surveying Field Work	
CO 1:	Apply the principle of surveying for civil Engineering Applications
CO 2:	Use techniques, skills and conventional surveying instruments necessary for engineering practice.
CO 3:	Make use of theodolite to find heights and distances as well as conducting trigonometric surveying
CO 4:	use the Equipment Total station and its applications
CO 5:	Calculate the areas, drawing plans and contour maps using different measuring equipment at field level
Course outcomes for Second Year Second Semester Course	
Course Code: 19110403	
Course Title: Mechanics of materials	
CO 1:	identify the basic concepts of Principal stresses, strains and various Theories of failures.
CO 2:	design the members for torsion, design the shafts and find the deflections of springs.
CO 3:	find the stresses in columns and struts.
CO 4:	calculate the Stresses under the combined action of direct loading and B.M and determine the stresses in the case of chimneys, retaining walls and dams.
CO 5:	evaluate forces in different types of trusses used in construction.
Course Code: 19110404	
Course Title: Hydraulics and Hydraulic Machinery	
CO 1:	solve problems in uniform, gradually and rapidly varied flows in open channel in steadystate conditions.
CO 2:	Apply dimensional analysis and to differentiate the model, prototype and similitude conditions for practical problems.
CO 3:	Calculate depth profiles in channels with steady gradually – varied flow.
CO 4:	Write the working principles of various hydraulic machineries.
CO 5:	Evaluate the different hydraulic machinery devices and its principles that will be utilized in hydropower development and for other practical usages
Course Code: 19110405	
Course Title: Structural Analysis	
CO 1:	Differentiate the determinate and indeterminate structures.
CO 2:	Identify the behaviour of structures due to the expected loads, including the moving loads, acting on the structure
CO 3:	Estimate the bending moment and shear forces in beams for different boundary conditions.
CO 4:	Analyse the continuous beams using various methods-, three moment method, slope deflection method, energy theorems.

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CO 5:	Draw the influence line diagrams for various types of moving loads on beams/bridges.
Course Code: 19110466A	
Course Title: Construction Technology and Management	
CO 1:	Evaluate the functioning of various earth moving equipment.
CO 2:	Explain the methods of production of aggregate products and concreting.
CO 3:	Apply the gained knowledge to project management and construction techniques.
CO 4:	Outline safety plans for demolition of buildings
CO 5:	Prepare fire safety plans for a given building
Course Code: 19110411	
Course Title: Fluid Mechanics & Hydraulic Machinery Laboratory	
CO 1:	Calibrate various discharge measurement meters in a open channel flow.
CO 2:	Measure the discharge through an open channel.
CO 3:	Draw performance curves by conducting experiments on various hydraulic machineries.
CO 4:	Conduct efficiency and performance tests on turbines and pumps.
CO 5:	Compare the results of analytical models introduced in lecture to the actual behaviour of real fluid flows and draw correct and sustainable conclusions
Course Code: 19110412	
Course Title: Environmental Engineering Laboratory	
CO 1:	Assess the quality of water and wastewater
CO 2:	Determine physical, chemical and biological characteristics of water and wastewater
CO 3:	Determine optimum dosage of coagulant
CO 4:	Determine break - point chlorination
CO 5:	Draw some conclusion and decide whether the water is potable or not.
Course outcomes for Third Year First Semester Course	
Course Code: 19110501	
Course Title: Theory of Structures	
CO 1:	Differentiate Determinate and Indeterminate Arch Structures
CO 2:	Carryout lateral Load analysis of structures
CO 3:	Analyse Cable and Suspension Bridge structures
CO 4:	Analyse structures using Kani's Method
CO 5:	Analyse structures using Matrix methods
Course Code: 19110502	
Course Title: Design of Reinforced Concrete Structures	
CO 1:	Carryout analysis and design of flexural members and detailing
CO 2:	Design structures subjected to shear, bond and torsion
CO 3:	Work on different types of design philosophies
CO 4:	Design different type of compression members
CO 5:	Design different type of Slabs and footings
Course Code: 19110503	
Course Title: Soil Mechanics	
CO 1:	To define various quantities related to soil mechanics and establish their inter-relationships. To

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	determine various index properties of the soils and classify the soils
CO 2:	To list down the importance of different engineering properties of the soil such as compaction, permeability
CO 3:	To calculate Stress Distribution In Soils
CO 4:	To list down the importance of consolidation and determine it
CO 5:	To list down the importance of shear strength and determine it
Course Code: 19110504	
Course Title: Engineering Geology	
CO 1:	Identify and classify the geological minerals
CO 2:	To Measure the rock strengths of various rocks
CO 3:	Classify and measure the earthquake prone areas to practice the hazard zonation
CO 4:	Investigate the ground conditions through geophysical surveys
CO 5:	Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc…
Course Code: 19110505	
Course Title: Hydrology Engineering	
CO 1:	To Have a thorough understanding of the theories and principles governing the hydrologic processes and measuring precipitation also to Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures
CO 2:	Estimate average rainfall, direct run off from total rain fall, groundwater flow and flood discharge in the catchment area
CO 3:	Develop Hydrograph for a given catchment
CO 4:	Estimate average rainfall, direct run off from total rain fall, groundwater flow and flood discharge in the catchment area
CO 5:	Examine the aquifer properties and assess the yield of the aquifer
Course Code: 19110566A	
Course Title: Repair & Rehabilitation of Structures	
CO 1:	Explain deterioration of concrete in structures
CO 2:	Carryout analysis using NDT and evaluate structures
CO 3:	Assess failures and causes of failures in structures
CO 4:	Carryout Physical evaluation and submit report on condition of the structure
CO 5:	Carry out Repair Techniques
Course Code: 19110566B	
Course Title: Expansive Soils	
CO 1:	Understand the behaviour of expansive soils
CO 2:	Assess the foundation practices on expansive soils
CO 3:	Perform the methods of stabilization expansive soils
CO 4:	Select additives and the methodology for stabilization
CO 5:	Apply the gained knowledge for suitable performance
Course Code: 19110566C	
Course Title: Airports, Docks and Harbour Engineering	
CO 1:	Plan an airport
CO 2:	Design the Runway
CO 3:	Design the Airport Drainage

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CO 4:	Plan Ports and Docks
CO 5:	Plan Harbours
Course Code: 19110566D	
Course Title: Environmental Impact Assessment	
CO 1:	Prepare EMP, EIS, and EIA report
CO 2:	Identify the risks and impacts of a project
CO 3:	Select an appropriate EIA methodology
CO 4:	Evaluate the EIA report
CO 5:	Know the role of stakeholder and public hearing in the preparation of EIA
Course Code: 19110511	
Course Title: Soil Mechanics Laboratory	
CO 1:	Determine index properties of soil and classify them
CO 2:	Determine permeability of soils
CO 3:	Determine Consolidation
CO 4:	Determine Compaction
CO 5:	Determine shear strength characteristics
Course Code: 19110512	
Course Title: Engineering Geology Lab	
CO 1:	Identify Mega-scope minerals & their properties.
CO 2:	Identify Mega-scope rocks & their properties
CO 3:	Identify the site parameters such as contour, slope & aspect for topography
CO 4:	Know the occurrence of materials using the strike & dip problems
CO 5:	Know engineering geology in detail
Course Code: 19110513	
Course Title: Mini Project-1/Study Project/Internship	
CO 1:	Student is able to construct the company profile by compiling the brief history, management structure, products / services offered, key achievements and market performance for his / her organization of internship
CO 2:	For his / her organization of internship, the student is able to assess its Strengths, Weaknesses, Opportunities and Threats (SWOT).
CO 3:	Student is able to determine the challenges and future potential for his / her internship organization in particular and the sector in general
CO 4:	Student is able to test the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period
CO 5:	Student is able to apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization
CO 6:	Student is able to analyse the functioning of internship organization and recommend changes for improvement in processes
Course outcomes for Third Year Second Semester Course	
Course Code: 19110661E	
Course Title: Solid Waste Management	
CO 1:	Understand the Objects of Solid waste management
CO 2:	Understand the elements of Solid waste management
CO 3:	Design the Transportation facility in Solid waste management

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CO 4:	Characterise the solid waste and design a composting facility
CO 5:	Know the criteria for selection of landfill
Course Code: 19110602	
Course Title: Design of Steel Structures	
CO 1:	Work with relevant IS codes
CO 2:	Carryout analysis and design of flexural members and detailing
CO 3:	Design compression members of different types with connection detailing
CO 4:	Design Plate Girder with connection detailing
CO 5:	Produce the drawings pertaining to different components of steel structures
Course Code: 19110603	
Course Title: Foundation Engineering	
CO 1:	Understand the various types of shallow foundations and decide on their location based on soil characteristics
CO 2:	Compute the magnitude of foundation settlement
CO 3:	Use the field test data and arrive at the bearing capacity
CO 4:	Apply the principles of bearing capacity of piles and design them accordingly.
CO 5:	To decide the size of the foundation
Course Code: 19110604	
Course Title: Transportation Engineering	
CO 1:	Plan highway network for a given area. Determine Highway alignment and design highway geometrics
CO 2:	Judge suitability of pavement materials and design flexible and rigid pavements. Construct highways
CO 3:	Design geometrics in a railway track
CO 4:	Design airport geometrics and airfield pavements
CO 5:	Plan, construct and maintain Docks and Harbours
Course Code: 19110605	
Course Title: Irrigation Engineering	
CO 1:	Estimate irrigation water requirements
CO 2:	Design and Plan irrigation canals and canal network
CO 3:	Design irrigation canal structures
CO 4:	Plan and design diversion head works
CO 5:	Analyse stability of gravity and earth dams and Design ogee spillways and energy dissipation works
Course Code: 19110606	
Course Title: Concrete Technology	
CO 1:	Understand the basic concepts of concrete
CO 2:	Realise the importance of quality of concrete
CO 3:	Familiarise the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field
CO 4:	Test the fresh concrete properties and the hardened concrete properties
CO 5:	Evaluate the ingredients of concrete through lab test results

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Course Code: 19110611	
Course Title: Software applications in Civil Engineering	
CO 1:	Work comfortably on GIS software
CO 2:	Digitize and create thematic map and extract important features
CO 3:	Develop digital elevation model
CO 4:	Use structural analysis software to analyse and design 2D and 3D frames
CO 5:	Design and analyse retaining wall and simple towers using CADD software
Course Code: 19110612	
Course Title: Concrete Technology & Transportation Engineering Laboratory	
CO 1:	Determine the consistency and fineness of cement
CO 2:	Determine the setting times of cement
CO 3:	Determine the specific gravity and soundness of cement
CO 4:	Determine the compressive strength of cement
CO 5:	Ability to test aggregates and judge the suitability of materials for the road construction
CO 6:	Ability to test the given bitumen samples and judge their suitability for the road construction
Course outcomes for Fourth Year First Semester Course	
Course Code: 19116761E	
Course Title: Global Environment: Problems & Policies	
CO 1:	To Understand core concepts and methods from ecological and physical sciences and their application in environmental problem-solving
CO 2:	To Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world
CO 3:	To Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems
CO 4:	To know environmental laws and grasp the concept of environmental legislation and its application in international environmental agreement
CO 5:	To appreciate the concern of environmental agreement
Course Code: 19110703	
Course Title: Pre stressed Concrete	
CO 1:	Understand the different methods of pre stressing
CO 2:	Estimate the effective prestress including the short- and long-term losses
CO 3:	Analyse and design prestressed concrete beams under flexure and shear
CO 4:	Understand the relevant IS Code provisions for prestressed concrete
CO 5:	Understand the Anchorage zone stresses
Course Code: 19110764-A	
Course Title: Advanced Structural Engineering	
CO 1:	Design raft foundations and different types of RCC retaining walls
CO 2:	Carryout analysis and design of different types of RCC water tanks
CO 3:	Design of Flat slabs and grid floors
CO 4:	Perform analysis and Design of chimneys
CO 5:	Understand various types of transmission towers and loading on them

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Course Code: 19110764-B	
Course Title: Ground Improvement Techniques	
CO 1:	Understand various methods of ground improvement and their suitability to different field situations
CO 2:	Design a reinforced earth embankment and check its stability
CO 3:	Know the various functions of Geo synthetics and their applications in Civil Engineering practice
CO 4:	Understand the concepts and applications of grouting
CO 5:	Understand the Reinforced earth technology and soil nailing
Course Code: 19110764-C	
Course Title: Traffic Engineering	
CO 1:	Determine traffic speed, volume, travel time and density
CO 2:	Design traffic signals
CO 3:	Determine highway capacity
CO 4:	To provide knowledge of traffic control devices and its techniques in transportation interaction.
CO 5:	To develop a strong knowledge base of traffic planning and its management in any transportation area
Course Code: 19110764-D	
Course Title: Watershed Management	
CO 1:	Calculate watershed parameters
CO 2:	Analyse watershed characteristics to take appropriate management action
CO 3:	Quantify soil erosion and design control measures
CO 4:	Suggest suitable harvesting techniques for better watershed management
CO 5:	Apply appropriate models for watershed management
Course Code: 19110765-A	
Course Title: Matrix Analysis of Structures	
CO 1:	Analyse the in determinant beams and frames by Stiffness method
CO 2:	Perform the structural analysis of determinate and indeterminate structures using classical compatibility methods, such as method of consistent deformations, force and equilibrium methods
CO 3:	Perform structural analysis using the stiffness method
CO 4:	Solve multiple degree of freedom two dimensional problems involving trusses, beams, frames and plane stress
CO 5:	Evaluate determinate and indeterminate trusses and its application in the field
Course Code: 19110765-B	
Course Title: Advanced Foundation Engineering	
CO 1:	Determine the bearing capacity of shallow foundations for different loading and ground conditions using different methods
CO 2:	Know the choice and type of shallow foundation and the design considerations and its design
CO 3:	Determine the allowable bearing capacity
CO 4:	Understand classification of piles and determine the load carrying capacity of piles by various methods and the pull- out capacity of piles and down drag forces on piles due to negative skin friction
CO 5:	Determine the load carrying capacity of pile groups and the load carrying capacity of laterally loaded piles

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Course Code: 19110765-C	
Course Title: Urban Transportation Planning	
CO 1:	To Create Knowledge on Origin and Destination Surveys and Analysis of survey data
CO 2:	To develop abilities required for Transport planning
CO 3:	To have knowledge on requirement of four stages of transportation planning
CO 4:	To Model the land utilization for urban transport planning
CO 5:	To Interpret the Traffic and Transportation Problems in Indian towns/cities
Course Code: 19110765-D	
Course Title: Remote Sensing and GIS	
CO 1:	understand ground, air and satellite-based sensor platforms
CO 2:	Interpret the aerial photographs
CO 3:	Create and input spatial data for GIS application
CO 4:	Apply RS and GIS concepts in water resources engineering
CO 5:	Interpret the satellite imageries
Course Code: 19110711	
Course Title: Infrastructure Design and Detailing Laboratory	
CO 1:	Design the Beams
CO 2:	Design the columns
CO 3:	Design the Slabs
CO 4:	Design the Water Tank
CO 5:	Design the Retaining Wall
Course Code: 19110731-19110721	
Course Title: Summer Internship/ Mini Project -2	
CO 1:	Acquire on job the skills, knowledge, and attitude, which are requisite to constitute a professional identity
CO 2:	Demonstrate professional values and ethical standards
CO 3:	Ability to handle real life challenges by making effective decisions at the organisations
CO 4:	Adapt effectively to changing conditions
Course outcomes for Fourth Year Second Semester Course	
Course Code: 191100801	
Course Title: Estimating, Specifications & Contracts	
CO 1:	Determine the quantities of different components of buildings
CO 2:	Find the cost of various building components
CO 3:	Capable of finalizing the value of structures
CO 4:	Prepare and evaluate contract documents
CO 5:	Impart the knowledge of Estimating, Costing and Valuation for Civil Engineering Structures
Course Code: 19110862-D	
Course Title: Industrial Waste & Waste - Water Engineering	
CO 1:	Suggest treatment methods for any industrial wastewater
CO 2:	Learn the manufacturing process of various industries
CO 3:	Student will be in a position to decide the need of common effluent treatment plant for the industrial area in their vicinity

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CO 4:	Identify and design treatment options for industrial wastewater
CO 5:	Formulate environmental management plan
Course Code: 19110841	
Course Title: Project	
CO 1:	Apply all levels of Engineering knowledge in solving the Engineering problems
CO 2:	Work together with team spirit
CO 3:	Use Civil Engineering software at least one
CO 4:	Document the projects

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GRBT-19 B.Tech (Electrical & Electronic Engineering)

Department Vision:

To be a pioneering department in preparing students to compete globally in theirprofession and making significant contribution to the society.

Department Mission:

- Establishing centers of excellence with focus on advancedtechnology
- By preparing the students for successful careers based on a strong normalethical foundation
- Delivering world class teaching, mentoring, intellectual stimulation, industry collaborations and state of the art research
- By training and educating students as global citizens to become entrepreneursin their chosen field

Program Educational Objectives (PEOs):

PEO1	Engage in ongoing learning and professional development throughself- study, continuing education in Electrical and Electronics Engineering and also in other allied fields
PEO2	Apply their engineering skills, exhibiting critical thinking and problem solving skills in professional engineering practices or tacklesocial, technical and business challenges
PEO3	Improve professional competence through lifelong learning includinghigher education and research

Program Specific Outcomes (PSO's):

PSO1	Apply knowledge of power system configuration, electrical equipment and protection practices to the design and specifications of electrical generation, transmission, distribution and utilization systems
PSO2	To design. Analyze, test and evaluate the performance of the electrical machines and transformers
PSO3	To develop the expertise in the technology associated with efficient conversion and control of electrical power by static means fromavailable forms to the required form
PSO4	Graduates will able to work as research fellow and implement their knowledge in all electrical and electronics research organization of defense, renewable energy, mines, chemical and power plants

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Program Outcomes (POs): Engineering Graduates will beable to:

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

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Course Outcomes for First Year First SemesterCourse	
Course Code: 19199101	
Course Title: Mathematics-I	
CO-1	Transform the knowledge of solving system of linear equations using matrices
CO-2	Evaluate the nature of the quadratic form
CO-3	Acquire the knowledge of maxima and minima of function of several v variables
CO-4	Evaluate multiple integrals and their applications
Course Code: 19199102	
Course Title: Communicative English-I	
CO-1	Develop effective reading strategies
CO-2	Demonstrate writing skills that are required for professional development and usegraphic elements for communication
CO-3	Apply grammatical skills and vocabulary effectively in speech and writing
CO-4	Display language efficacy in tune with subjective knowledge
Course Code: 19192106	
Course Title: Engineering Electro magnetic	
CO-1	Analyze field potentials due to static changes and static magnetic fields
CO-2	Explain how materials affect electric and magnetic fields
CO-3	Analyze the relation between the fields under time varying situations.
CO-4	Discuss the principles of propagation of uniform plane waves.
CO-5	Justify the concepts of electromagnetic waves, mean of transporting energy or information. in the form of radio waves, TV signals, radar beams and light rays
Course Code: 19199103	
Course Title: Applied Chemistry	
CO-1	Understand the removal technique of hardness of the water
CO-2	Distinguish the fuel cells and batteries
CO-3	Identify different control techniques of corrosion
CO-4	Understand the concept of plastics and rubbers
Course Code: 19195105	
Course Title: Problem Solving & Programming in C	
CO-1	Obtain the knowledge about different languages used in computer programming
CO-2	Write algorithm. Flow chart, and structure of C program and make use of different C tokens
CO-3	Develop program by using control structure , different looping and Jump statements
CO-4	Implement applications of Array, structure and String inside the program
Course Code: 19199194	
Course Title: Professional Ethics & Human Values	
CO-1	By the end of the course student should be able to understand the importance ofethics and values in life and society

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Course Code: 19199114	
Course Title: Engineering Chemistry Laboratory	
CO-1	Explain the functioning of the instruments such as pH, Conductivity and Potentiometric meters
CO-2	Determine the total hardness of the water
CO-3	Perform various Redox titrations
CO-4	Preparation of polymers
Course Code: 19193112	
Course Title: Basic Engineering Workshop	
CO-1	Explain the limitations, tolerances, safety aspects of electrical systems & wiring.
CO-2	Select wires/cables and other accessories used in different types of wiring
CO-3	Make simple lighting and power circuits
CO-4	Make disassembling and assembling of PC.
Course Code: 19199111	
Course Title: Communicative English Laboratory	
CO-1	Learn to communicate in English
CO-2	Comprehend native speaker's accent
CO-3	Speak appropriately in real life situations
CO-4	Display public speaking skills in the required context
Course Code: 19195113	
Course Title: Problem Solving & Programming Laboratory with C	
CO-1	Obtain the knowledge about different languages used in computer programming
CO-2	Write algorithm. Flow chart, and structure of C program and make use of different C tokens
CO-3	Develop program by using control structure , different looping and Jump statements
CO-4	Implement applications of Array, structure and String inside the program
Course Outcomes for First Year Second Semester Course	
Course Code: 19199201a	
Course Title: Mathematics-II	
CO-1	Solve first order differential equations
CO-2	Solve higher order differential equations with constant coefficients
CO-3	Understand numerical differentiation and integration
Course Code: 19199204	
Course Title: Engineering Physics	
CO-1	To impart knowledge of physical optical phenomenon like interference, diffractionand polarization
CO-2	To demonstrate the concept of absorption and emission
CO-3	To study the Schrodinger equation for standard systems by analytical and numerical methods

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CO-4	To classify the energy bands of semiconductors
Course Code: 19199202	
Course Title: Communicative English-II	
CO-1	Develop effective reading strategies
CO-2	Demonstrate writing skills that are required for professional development and usegraphic elements for communication
CO-3	Apply grammatical skills and vocabulary effectively in speech and writing
CO-4	Display language efficacy in tune with subjective knowledge
CO-5	Use required language along with contextual vocabulary and grammar structures
Course Code: 19199296a	
Course Title: Environmental Science	
CO-1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems
CO-2	Comprehend environmental problems from multiple perspectives with emphasis on human modern life styles and developmental activities
CO-3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of 21st century
CO-4	Recognize the interconnectedness of human dependence on the earth's eco system
Course Code: 19192203	
Course Title: Electrical circuit analysis-I	
CO-1	Analyze electrical network in presence of active and passive elements
CO-2	Analyze magnetic circuit with various dot convention
CO-3	Analyze steady state circuits
CO-4	Analyze series and parallel resonant circuit
CO-5	Analyze electric circuits using Network Theorems
Course Code: 19193275	
Course Title: Engineering Graphics	
CO-1	Apply principles of drawing to represent dimensions of an object
CO-2	Outline the Polygons and engineering curves
CO-3	Illustrate projections of points, lines, plane and solids
CO-4	Illustrate 3D views through isometric views
Course code : 19199212	
Course Title: Engineering Physics Laboratory	
CO-1	To handle optical instruments like microscope and spectrometer
CO-2	To demonstrate the importance of dielectric material in storage of electric field energyin capacitors

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CO-3	To evaluate the resistivity of the given semiconductor using probe method
CO-4	To identify the type of semi-conductor
Course Code: 19199211	
Course Title: Communicative English Laboratory II	
CO-1	Learn to communicate in English
CO-2	Comprehend native speaker's accent
CO-3	Speak appropriately in real life situations
CO-4	Display public speaking skills in the required context
Course code : 19192213	
Course Title: Electrical Engineering workshop	
CO-1	Explain the limitations, tolerances, safety aspects of electrical systems & wiring.
CO-2	Select wires/cables and other accessories used in different types of wiring.
CO-3	Make simple lighting and power circuits.
CO-4	Measure current, voltage and power in a circuit.
CO-5	Make disassembling and assembling of PC

Course Outcomes for Second Year First SemesterCourse	
Course Code: 19120301	
Course Title: Complex variables and Transform Techniques	
CO-1	Familiarize with the techniques in partial differential equations and complex variables
CO-2	Solve application problems
CO-3	Familiarize the transform techniques and complex variables
Course Code: 19120302	
Course Title: Electrical Circuits Analysis-II	
CO-1	Able to solve three- phase circuits under balanced and unbalanced condition
CO-2	Learn transient response of electrical networks for different types of excitations.
CO-3	To find parameters for different types of network.
CO-4	To realize electrical equivalent network for a given network transfer function.
CO-5	To extract different harmonics components from the response of a electrical network..
Course Code: 19120303	
Course Title: Electrical Machines – I	
CO-1	Analyze the conditions required of self excitation of dc generators and parallel operationof dc generators the operation of dc machines
CO-2	Determine the performance of dc machine using the results of tests
CO-3	Distinguish the operation of various dc machine configurations.
CO-4	Determine the voltage regulation and efficiency of single phase transformer
CO-5	Analyze poly phase transformers connections

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Course Code: 19120304	
Course Title: Electronic Devices & Circuits	
CO-1	Understand the basic concepts of semiconductor physics
CO-2	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
CO-3	Know the construction, working principle of rectifiers with and without filters withrelevant expressions and necessary comparisons
CO-4	Understand the construction, principle of operation of transistors, BJT and FET withtheir V-I characteristics in different configuration
CO-5	Know the need of transistor biasing, various biasing techniques for BJT and FET andstabilization concepts with necessary expressions
Course Code: 19120305	
Course Title: Electrical Measurements	
CO-1	Know principles of different electrical measurement instruments and to measure voltageand current and different types of instruments for measurement of Power and Energy.
CO-2	Understand about different types of A.C and D. C Potentiometers
CO-3	Measure resistance, capacitance, inductance and frequency by using various bridges
CO-4	Know about the magnetic measurements
CO-5	Understand about digital measurements
Course Code: 19120312	
Course Title: Electrical Circuits Lab	
CO-1	Apply mesh and nodal analysis to solve electrical circuit problems
CO-2	Analyze circuits in the sinusoidal steady-state domain
CO-3	Apply network theorems for the analysis of circuits and two port networks
CO-4	Measure active and reactive powers
CO-5	Measure Network parameters
Course Code: 19120313	
Course Title: Electrical Machines –I Lab	
CO-1	Determine the performance of DC shunt machine
CO-2	Determine the performance of DC series machine
CO-3	Determine the performance of DC compound machine
CO-4	Connect DC machines in parallel
CO-5	Control speed of DC machine
Course Code: 19120314	
Course Title: Electrical Measurements Lab	
CO-1	Measure accurately the electrical parameters voltage, current, power, energy
CO-2	Electrical characteristics of resistance, inductance and capacitance.
CO-3	Measure illumination of electrical lamps.
CO-4	Test transformer oil for its effectiveness.
CO-5	Measure the parameters of inductive coil in a 1-Ø transformer.

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Course Code: 19124311	
Course Title: Electronic Devices & Circuits Lab	
CO-1	Analyze the characteristics of diodes, transistors and other devices
CO-2	Design and implement the rectifier circuits, SCR and UJT in the hardware circuits
CO-3	Design the biasing and amplifiers of BJT and FET amplifiers
CO-4	Measure electrical quantities using CRO in the experimentation
CO-5	Understand the frequency response of amplifiers, measure frequency, phase of signals.
Course Outcomes for Second Year Second SemesterCourse	
Course Code: 19129401	
Course Title: Numerical Methods and Probability & Statistics	
CO-1	Familiarize with the techniques in partial differential equations and complex variables
CO-2	Solve application problems
CO-3	Familiarize the transform techniques and complex variables
Course Code: 19120405	
Course Title: Power systems -I	
CO-1	Understand the Principle of operation of different types of conventional power generatingstations.
CO-2	Classify Distribution system and its design
CO-3	Classify Substations
CO-4	Types of Underground cables
CO-5	Understand Economic aspects and tariff
Course Code: 19120406	
Course Title: Electrical Machines – II	
CO-1	Demonstrate ability to understand operation and working of 3-Ph induction motor
CO-2	Analyze performance alternator when connected in parallel with infinite bus or withanother alternator
CO-3	Determine the voltage regulation of alternator through indirect methods and parallel operation of alternators
CO-4	Demonstrate ability to understand the concepts of synchronous motor's working and methods to start synchronous motor.
CO-5	Explain the working and starting methods of 1-phase induction motor
Course Code: 19123403	
Course Title: Fluid Mechanics & Hydraulic Machinery	
CO-1	Define fundamental concepts of fluid mechanics as applied to civil engineering and environmental problems
CO-2	Discuss and derive the fundamental mathematical equations of fluid mechanics
CO-3	Solve the problems of water conveyance in pipes, orifices, mouthpieces, notches and weirs
CO-4	Apply conservation laws to derive governing equations of fluid flows
CO-5	Compare hydrostatic and hydrodynamic forces

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Course Code: 19124402	
Course Title: Internet of things	
CO-1	Understand IOT development cycles, infrastructure, challenges and requirements
CO-2	Learn about the wired and wireless communication protocols implementation
CO-3	Learn about privacy , Types of threats, and security challenges present in IOT and IOT clouds
CO-4	Analyze various measurement methods and errors and their impact on IOT development
CO-5	Develop IOt based products for real life applications
Course Code: 19120412	
Course Title: Electrical Machines – II Lab	
CO-1	Determine the efficiency and regulation of transformers and asses their performance.
CO-2	Determine the performance of 1-Ø Induction motor.
CO-3	Determine the regulation of three–phase alternator by various methods
CO-4	Find Xd / Xq ratio of alternator and asses the performance of three–phase synchronousgenerator.
CO-5	Experiment various tests on Induction motor for assessing its performance
Course Code: 19123411	
Course Title: Fluid Mechanics & Hydraulic Machinery Lab	
CO-1	Define and Measure Fluid Properties.
CO-2	Illustrate Flow Measuring Devices used in pipes, channels and Tanks
CO-3	Analyze characteristics of broad crested weir.
CO-4	Illustrate the characteristics of surface profiles in free and forced vibrations.
Course Code: 1920412	
Course Title: Basic Automobile Engineering	
CO-1	Compare different types of automobiles and their components
CO-2	Differentiate working principles of different types of automobile engines
CO-3	Illustrate working of different transmission elements and control systems
CO-4	Implement different types of safety systems
CO-5	Implement effective pollution reduction methods
Course Outcomes for Third Year First Semester Course	
Course Code: 19120503	
Course Title: Control Systems	
CO-1	Derive the transfer function of physical systems and determination of overall transferfunction using block diagram algebra and signal flow graphs.
CO-2	Determine time response specifications of second order systems and to determine errorconstants
CO-3	Analyze absolute and relative stability of LTI system using Routh's and the root locus method
CO-4	Analyze the stability of LTI systems using frequency response methods

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Course Code: 19120504	
Course Title: Power Systems-II	
CO-1	Understand the parameters of various types of transmission lines and to understand the performance of short, medium, long transmission lines
CO-2	Understand the effects of skin, proximity, Ferranti, corona effects on transmission lines
CO-3	Understand the power system transients & sag, mechanical design of overhead lines and insulators
CO-4	Understand different methods of generation, distribution, control and compensationinvolved in the operation of power systems
Course Code: 19124501	
Course Title: Digital Electronics	
CO-1	Analyze different number systems, its conversions
CO-2	Analyze different types of logic gates and fundamentals of karnaugh maps
CO-3	Understand the design of combinational and sequential circuits using logic gates
CO-4	Understand the fundamentals of op-amps, its circuits and parameters
Course Code: 19120565a	
Course Title: Power system dynamics & control	
CO-1	Understand the power stability problems
CO-2	Understand the basic concepts of modeling of synchronous machine and power system components
CO-3	Analyze the stability issues in interconnected systems
CO-4	Understand the power system stability analysis tools and enhancement of power system stability
Course Code: 19120565b	
Course Title: Special electrical machines	
CO-1	Explain theory of operation and control of switched reluctance motor
CO-2	Explain the performance and control of stepper motors, and their applications
CO-3	Describe the operation and characteristics of permanent magnet dc motor
CO-4	Understand the operation and characteristics of brush less dc motor.
Course Code: 19120565c	
Course Title: Advanced control systems	
CO-1	Explain theory of operation and control of switched reluctance motor
CO-2	Explain the performance and control of stepper motors, and their applications
CO-3	Describe the operation and characteristics of permanent magnet dc motor
CO-4	Understand the operation and characteristics of brush less dc motor.

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Course Code: 19120565d	
Course Title: Advanced power conversion systems	
CO-1	Understands the basics in the electric power conversion using power switching devices
CO-2	Evaluate the conversion for range of renewable energy sources with the help of availableelectrical machines drives
CO-3	Analyzes the different energy storage systems
CO-4	Identify the various Industrial and domestic applications
Course Code: 19123562e	
Course Title: Hybrid and Electric Vehicles	
CO-1	Grade hybrid electric technology and electronic drive trains
CO-2	Construction of hybrid electric vehicles
CO-3	Demonstrate electric vehicle components
CO-4	Construction of Electric vehicle technology
CO-5	Operate fuel cell technology and Identification of fuel cell based vehicles
Course Code: 19120512	
Course Title: Control Systems Lab	
CO-1	Derive the transfer function of physical systems and determination of overall transferfunction using block diagram algebra and signal flow graphs
CO-2	Determine time response specifications of second order systems and to determine errorconstants
CO-3	Analyze absolute and relative stability of LTI systems using Routh's stability criterion andthe root locus method.
CO-4	Analyze the stability of LTI systems using frequency response methods
Course Code: 19124511	
Course Title: Digital Electronics Lab	
CO-1	Learn the basics of gates, filp-flops and counters
CO-2	Construct basic combinational circuits and verify their functionalities
CO-3	Apply the design procedures to design basic sequential circuits
CO-4	Understand the basic digital circuits and to verify their operation
CO-5	Design ripple counter and synchronous counter
Course Code: 19129596	
Course Title: Constitution of India	
CO-1	List the fundamental rights and duties
CO-2	Explain the union Government and state Government
CO-3	Explain the State Government and Administrative system
CO-4	Explain the Local Administrative system

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Course Code: 19120521	
Course Title: Mini Project-I/ Study Project/ Internship	
CO-1	Achieve practical knowledge within his chosen area of technology for project development.
CO-2	Identify, analyze, formulate and handle electronics & communications projects with a systematic and comprehensive approach.
CO-3	Contribute as an individual or as member of team in development of technical projects.
CO-4	Develop effective communication skills for presentation of project related activities.
Course Code: 19120522	
Course Title: Community service oriented project	
CO-1	Achieve practical knowledge within his chosen area of technology for project development.
CO-2	Identify, analyze, formulate and handle electronics & communications projects with asystematic and comprehensive approach.
CO-3	Contribute as an individual or as member of team in development of technical projects.
CO-4	Develop effective communication skills for presentation of project related activities.
Course Outcomes for Third Year Second Semester Course	
Course Code: 19120665a-Professional Elective - II	
Course Title: Utilization of electrical energy	
CO-1	Identify most appropriate heating or welding techniques for suitable applications
CO-2	understand various level of luminosity produced by different illuminating sources
CO-3	Identify most appropriate heating or welding techniques for suitable applications
CO-4	understand various level of luminosity produced by different illuminating sources
Course Code: 19120665b	
Course Title: Power semi-conductor drives	
CO-1	Know the fundamentals of electric drive and different electric braking methods
CO-2	Analyze the operation of three phase converter controlled dc motors and four quadrantoperation of dc motors using dual converters.
CO-3	Know the converter control of dc motors in various quadrants
CO-4	Know the concept of speed control of induction motor by using AC voltage controllers andvoltage source inverters

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Course Code: 19120665c	
Course Title: Digital control systems	
CO-1	Know the fundamentals of electric drive and different electric braking methods
CO-2	Analyze the operation of three phase converter controlled dc motors and four quadrantoperation of dc motors using dual converters.
CO-3	Know the converter control of dc motors in various quadrants
CO-4	Know the concept of speed control of induction motor by using AC voltage controllers andvoltage source inverters
Course Code: 19120665d	
Course Title: Solar energy systems	
CO-1	Understand various terms in solar energy
CO-2	Design solar collector plates
CO-3	Understand solar heating and cooling systems and solar energy storage techniques
CO-4	Analyze the PV system applications and know the government support for solar energy
Course Code: 19124601	
Course Title: Power Electronics	
CO-1	Demonstrate the characteristics of various power semiconductor devices
CO-2	Analyze different electrical parameters of single phase AC-DC converters and semiconverters for different loads and to evaluate the converters performance
CO-3	Analyze different DC-DC converters for different loads and to evaluate the convertersperformance.
CO-4	Understand the working of AC-AC voltage regulators and cyclo-converters, inverters andapplication of PWM techniques for voltage and harmonic mitigation
Course Code: 19124601	
Course Title: Microprocessors & Micro-controllers and applications	
CO-1	Do assembly language programming
CO-2	Do interfacing design of peripherals like I/O, A/D, D/A, timer etc
CO-3	Develop systems using different microcontrollers
CO-4	learn hardware and software interaction and integration
Course Code: 19124603	
Course Title: Switch Gear & Protection	
CO-1	Understand the principles of arc interruption for application to high voltage circuit breakersof air, oil, vacuum, SF6 gas type.

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CO-2	Understand the working principle and constructional features of different types ofelectromagnetic protective relays
CO-3	Knowledge of faults that is observed to occur in high power generator and transformers andprotective schemes used for all protections
CO-4	Understand about static relays and various types of protective schemes used for feeders andbus bar protection
Course Code: 19124604	
Course Title: Power system analysis	
CO-1	Draw an impedance diagram and SLD for a power system network and form a Y-busmatrix for a power system network with or without mutual couplings.
CO-2	Find out the load flow solution of a power system network using different types of load flow methods
CO-3	Formulate the Z-bus for a power system network.
CO-4	Find out the fault currents for all types faults with a view to provide data for the design of protective devices
Course Code: 19124611	
Course Title: Microprocessors & Micro-controllers and applications Lab	
CO-1	Do assembly language programming
CO-2	Do interfacing design of peripherals like I/O, A/D, D/A, timer etc
CO-3	Develop systems using different microcontrollers
CO-4	Do assembly language programming
Course Code: 19120612	
Course Title: Power Electronics Lab	
CO-1	Know the characteristics of various power electronic devices and Analyze firing circuit and commutation circuits of SCR
CO-2	Analyze the performance of single phase and three phase full wave bridge converters, singlephase dual converter with both resistive and inductive loads
CO-3	Understand the operation of AC voltage controller and cycle converter with resistive andinductive loads
CO-4	Understand the working of Buck converter, Boost converter, single phase bridge inverter andPWM inverter.
Course Code: 19129696	
Course Title: Soft Skills	
CO-1	Construct coherent, cohesive and unambiguous verbal expressions in both oralAnd written discourses.
CO-2	Analyze the given data/text and find out the correct responses to the questions asked based on there aiding exercises; identify relationships or patterns within groups of wordsor sentences
CO-3	Write paragraphs on a particular topic, essays (issues and arguments), e mails, summaries of group discussions, reports, make notes, statement of purpose(for admissioninto foreign universities), letters of recommendation(for professional and educational purposes).
CO-4	Converse with ease during interactive sessions/seminars in their classrooms, compete inliterary activities like elocution, debates etc., raise doubts in class, participate in JAM sessions/versant tests with confidence and convey oral information in a professional manner.

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GR-19 B.Tech Mechanical Engineering

B.TECH–MECHANICAL ENGINEERING

Department Vision: To be recognized as a Global Centre of Excellence in Mechanical Engineering Education, Research and Consultancy

Department Mission: Department of Mechanical Engineering strives to provide scope for all round development of the students and staff by engaging them in various activities such as

Participative learning so that students internalize their classroom learning practices.

Student centric learning practices such as summary sessions, learn-ahead-of class, problem solving.

Extensive practical courses to foster learning by observation.

Exposing students, faculty and staff to various industrial practices and usage of modern tools to

reinforce their classroom/laboratory learning.

Sensitization towards importance of ethical practice, societal responsibility, leadership skills,

Entrepreneurship skills, communication skills and lifelong learning.

Program Educational Objectives (PEOs):

PEO1	Working professional in Mechanical Engineering field or other disciplines to develop products, processes to solve Mechanical Engineering related or other problems for betterment of society.
PEO2	Pursuing further education to enrich their knowledge in Mechanical Engineering or other fields.
PEO3	Undertaking entrepreneurial ventures in Mechanical Engineering or other disciplines.

Program Specific Outcomes (PSO's):

PSO1	Join a technically sophisticated workforce as successful professionals in a wide range of mechanical engineering and related fields.
PSO2	Continuously improve and expand their technical and professional skills through formal means as well as through informal self-study.
PSO3	Pursue advanced degrees in engineering, business, or other professional fields.
PSO4	Advance themselves professionally and personally by accepting professional and social responsibilities and pursuing leadership roles.

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Program Outcomes (POs):Engineering Graduates will be able to:

1	Apply fundamental knowledge of Science, Mathematics and Engineering principles in solving problems related to Mechanical Engineering.
2	Apply principles of design engineering, thermal engineering, production engineering and industrial engineering to arrive at a physically meaningful analysis of engineering problems.
3	Present feasible designs for simple domestic and industrial Mechanical Engineering problems through drawings and other multimedia tools to meet desired needs.
4	Identify, formulate and solve Mechanical engineering problems through rigorous research methodology.
5	Use Drafting, Modeling and Analysis Software and/or hardware tools for meaningful and economically viable Engineering practice.
6	Apply knowledge of Thermal, Design, Automation Technologies and Management principles to inter-disciplinary engineering problems and their societal implications.
7	Understand and propose, where ever possible, environment-friendly and sustainable solutions to Mechanical Engineering problems.
8	Expertise in following ethical code of conduct in professional activities.
9	Use their analytical, teamwork, leadership skills in the development of products and provide solutions to problems sought by local and/or global community.
10	Communicate verbally, textually and graphically to collaborate effectively towards engineering activities
11	Inspire confidence in team members to realize the goals of the organization and manage finances an sizeable projects by choosing the right blend of common sense solutions.
12	Develop confidence and a sense of curiosity towards life-long learning to adapt to ever changing technologies.

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Course out comes (Cos)of all courses of all programs offered by the institution

Course outcomes for First Year First Semester Course	
Course Code:19198101	
Course Title: Mathematics - I	
CO1:	Transform the knowledge of solving system of linear equations using matrices.
CO2:	Evaluate nature of the Quadratic form.
CO3:	Acquire the knowledge maxima and minima of function of several variables.
CO4:	Evaluate multiple integrals and their applications.
CO5:	Understand and apply vector derivatives and vector integration theorems.
Course Code:19198102	
Course Title: Communicative English-I	
CO1:	Develop effective reading strategies
CO2:	Demonstrate writing skills that are required for professional development and use graphic elements for communication.
CO3:	Apply grammatical skills and vocabulary effectively in speech and writing
CO4:	Display language efficacy in tune with subjective knowledge
CO5:	Use required language along with contextual vocabulary and grammar structures
Course Code: 19198103	
Course Title: Engineering Chemistry	
CO1:	Understand the removal techniques of hardness of water
CO2:	Distinguish the fuel cells and batteries
CO3:	Identify different control techniques of corrosion
CO4:	Understand the concepts of plastics and rubbers
CO5:	Analyse the importance of nanomaterials.
Course Code:19199104	
Course Title: Basic Electrical and Electronics Engineering	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation of DC machines,3-point starter and conduct the Swinburne's Test.
CO3:	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.
Course Code :19198105	
Course Title:Professional Ethics & Human Values	
CO1:	Create awareness on professional ethics and Human values
CO2:	Create awareness on engineering ethics providing basic knowledge about engineering ethics, Variety of moral dilemmas Professional ideas and virtues
CO3:	Provide basic familiarity about engineers as responsible experimenters, Research etics, codes of ethics, Industrial standards
CO4:	Inculcate knowledge and exposure on safety and risk, risk benefit analysis andhave an idea about collective bargaining, confidentiality, professional, employee, intelluctual property rights
CO5:	Have an adequate knowledge about MNC's Business environment, computer ethics moral leadership Sample code of conduct, cyber crime
Course Code: 19198176	
Course Title:Engineering Graphics	
CO1:	Apply principles of drawing to represent dimensions of an object.
CO2:	Outline the polygons and engineering curves.
CO3:	Illustrate projections of points, lines, planes and solids.
CO4:	Illustrate the 3D views through isometric views.
CO5:	Create the isometric views and orthographic views
Course Code: 19198112	
Course Title: Engineering Chemistry Laboratory	
CO1:	Explain the functioning of the instruments such as pH, conductivity, and potentiometric meters.
CO2:	Determine the total hardness of water
CO3:	Perform various redox titrations.
CO4:	Preparation of polymers
CO5:	Compare viscosities of different oils
Course Code: 19199113	
Course Title:Basic Electrical and Electronics Engineering Laboratory	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation or DC machines,3 -point starter and conduct the

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	Swinburne's Test.
CO3:	Analyze the performance oi transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.
Course outcomes for First Year Second Semester Course	
Course Code:19198201	
Course Title: Mathematics – II	
CO1:	Solve first order differential equations.
CO2:	Solve higher order differential equations with constant coefficients
CO3:	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems.
CO4:	Understand numerical differentiation and integration.
CO5:	Apply the knowledge of different algorithms for approximating the solution of ordinary differential equations in practical engineering problems.
Course Code:19198202	
Course Title: Communicative English-II	
CO1:	Paraphrase short academic texts using suitable strategies and conventions
CO2:	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
CO3:	Build the ability to convey in different communicative forms.
Course Code:19198203	
Course Title: Engineering Physics and its Applications	
CO1:	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution. To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics
CO2:	To assess the electromagnetic wave propagation in different media and its power and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors.
CO3:	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.
CO4:	To interpret dielectric loss, Lorentz field and Claussius - Mosotti relation and classify the magnetic materials based on susceptibility and their temperature dependence. To apply the Gauss' Theorem for divergence and Stokes' theorem for curl and evaluate Maxwell's displacement current and correction in Ampere's law.
Course Code:19199204	
Course Title: Problem Solving & Programming in C	
CO1:	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO2:	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO3:	Develop program by using Control structure, different looping and Jump statement.
CO4:	Implement applications of Array, Structure and String inside the program.
CO5:	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.
Course Code: 19198205	
Course Title: Environmental Studies	
CO1:	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO2:	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO3:	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO4:	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO5:	Influence their society in proper utilization of goods and services.
Course Code: 19198206	
Course Title: Engineering Mechanics	

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CO1:	Carry out composition of system of forces.
CO2:	Analyse rigid bodies in static equilibrium condition under system of forces including friction.
CO3:	Determine centre of gravity and moment of inertia of simple and composite planar, solid sections.
CO4:	Carry out dynamic analysis of rigid bodies under translation, rotation and plane motion.
CO5:	Apply work energy and impulse momentum principles to rigid body motion.
Course Code:19198211	
Course Title: Communicative English Laboratory-II	
CO1:	Learn to communicate in English
CO2:	Comprehend native speaker's accent
CO3:	Speak appropriately in real life situations
CO4:	Display public speaking skills in the required context
CO5:	Handle different communicative situations
Course Code:19198212	
Course Title: Engineering Physics Laboratory	
CO1:	To handle optical instruments like microscope and spectrometer, determine thicknessof a hair/paper with the concept of interference and to estimate the wavelength andresolving power of different colors using diffraction grating
CO2:	To demonstrate the importance of dielectric material in storage of electric field energy in the capacitors and plot the intensity of the magnetic field of circular coil carrying current with varying distance
CO3:	To evaluate the acceleration due to gravity using compound pendulum
CO4:	To determine the moment of inertia using Fly wheel
Course Code:19199213	
Course Title: Problem Solving & Programming Laboratory using C	
CO1:	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO2:	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO3:	Develop program by using Control structure, different looping and Jump statement.
CO4:	Implement applications of Array, Structure and String inside the program.
CO5:	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.
Course Code: 19198214	
Course Title:Basic Engineering Workshop	
CO1:	Experiment with various basic house wiring techniques.
CO2:	Develop basic prototype in the trade of tin smithy such as square tray and open scoop.
CO3:	Design v-fitting and square fitting in the trade of fitting
CO4:	Making square rod and L-bend from the round rod in black smithy
CO5:	Build various prototype like T lap joint, dovetail joint, cross lap etc. in the trade of carpentry.

Course Outcomes for Second Year First Semester Course

Course Code:19130303	
Course Title: Mechanics of Solids	
CO-1	Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials.
CO-2	Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings.
CO-3	Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural.

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CO-4	Calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels.
CO-5	Able to calculate the failure load of column and struts with different type of end condition.
Course Code:19130304	
Course Title: Kinematics of Machinery	
CO-1	Explain about the mobility and inversions of a planar mechanism.
CO-2	Discuss mechanisms with lower pairs
CO-3	Determine the velocity and acceleration for the planar mechanisms
CO-4	Analyse the motion of the cams and followers.
CO-5	Analyse Gears and Gear Trains
Course Code:19130305	
Course Title: Thermodynamics	
CO-1	Explain the importance of thermodynamic properties related to conversion of heat energy into work.
CO-2	Apply the laws of thermodynamics to boilers, heat pumps, refrigerators, IC engines, compressors and nozzles.
CO-3	Utilize steam properties in components of heat engines running with steam.
CO-4	Compare air standard cycles using thermodynamic relations.
CO-5	Apply thermodynamics in solving engineering problems relates heat and work
Course Code:19130306	
Course Title: Fluid Mechanics & Hydraulic Machinery	
CO-1	Discuss the properties of fluids, pressure and its measurement.
CO-2	Identify the types lines, flows and derive continuity equation, Bernoulli's equation and Buckingham's π theorem.
CO-3	Examine the energy losses in pipes and sketch EGL. Discuss about the flow measuring devices. Learn the concepts of boundary layer.
CO-4	Describe working of hydraulic turbines and performance characteristics.
CO-5	Describe working centrifugal and reciprocating pumps and its performance.
Course Code: 19130311	
Course Title: Mechanics of Solids & Metallurgy lab	
CO-1	Determine the Young's Modulus for ductile materials and analyze the various points on stress strain diagram.
CO-2	Analyze& compare the hardness values for various materials.
CO-3	Understand various micro structures and relationship to properties.
CO-4	Compare the Micro structures of Ferrous & Non-Ferrous Alloys.
CO-5	Improving material properties by different heat treatment processes.
Course Code:19130312	
Course Title: Fluid Mechanics & Hydraulic Machinery Lab	
CO-1	Understand the concept of flow measuring devices and determine the coefficient of discharge of Venturimeter and Orifice meter
CO-2	Apply the knowledge of Centrifugal pump and Reciprocating pump in real life situations and find out the

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	performance of pumps.
CO-3	Evaluate the performance parameters of hydraulic turbines Pelton wheel and Francis turbine.
CO-4	Understand the concept of flow through pipes and determine the losses.
CO-5	Justify the Bernoulli's theorem
Course Outcomes for Second Year Second Semester Course	
Course Code:19139401	
Course Title:Numerical Methods and Probability & Statistics	
CO-1	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems.
CO-2	Apply the knowledge of different algorithms for approximating the solution of ordinary differential equations in practical Engineering problems.
CO-3	Demonstrate the knowledge of probability distributions
CO-4	Enhance knowledge of a classical hypothesis techniques
CO-5	Enhance knowledge in inferential methods based on small and large sampling tests.
Course Code:19130402	
Course Title: Dynamics of Machinery	
CO-1	Analyze stabilization of sea vehicles, aircrafts and automobile vehicle.
CO-2	Investigate the frictional losses & torque transmission of mechanical systems.
CO-3	Design the flywheels and governors for suitable applications.
CO-4	Identify and Solve the unbalanced forces in reciprocating and rotary masses.
CO-5	Explain the concepts of free and forced vibrations of single degree freedom systems.
Course Code:19130403	
Course Title:Thermal Engineering -I	
CO-1	Analyse all the thermodynamic relations of IC Engines & Air Compressors
CO-2	Classify various types of IC Engines, Air compressors & cycle of operations
CO-3	Demonstrate the effect of various operating variables on engine performance
CO-4	Estimate performance and various efficiencies of IC Engine & Air compressors
CO-5	Design and evaluate performance and various efficiencies of IC Engine & Air compressors.
Course Code:19130404	
Course Title: Production Technology	
CO-1	Understand principles of sand casting processes.
CO-2	Discuss various casting methods and melting methods.
CO-3	Demonstrate welding methods and their applications.
CO-4	Explain metal forming methods such as rolling, forging, extrusion and sheet metal forming methods.
CO-5	Interpret the methods of fabrication of different plastics.

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Course Code: 19130411	
Course Title: Computer Aided Drawing Practice	
CO-1	Illustrate the importance of CAD package and its basic commands.
CO-2	Produce the orthographic projections of regular solids.
CO-3	Develop the lateral surfaces of regular solids and interpenetration curves
CO-4	Convert to Isometric drawings and 3D Surface Models.
CO-5	Connect simple parts using CAD Package
Course Code: 19130412	
Course Title: Thermal Engineering Lab	
CO-1	Calculate various powers, efficiencies and energy balance for several types of Internal Combustion Engines and compressors.
CO-2	Classify various types of IC Engines, Air compressors & cycle of operations
CO-3	Demonstrate the effect of various operating variables on engine performance
CO-4	Estimate properties of various fuels and lubricants.
CO-5	Evaluate Coefficient of Performance of Refrigeration and Air-conditioning units
Course Code:19130413	
Course Title: Production Technology Lab	
CO-1	Understand the fundamentals of pattern making, melding process./understand the pattern design and making using wood turning lathe.
CO-2	Gain knowledge in sand casting processes.
CO-3	Learn on Welding processes like MMAW. Gas welding and cutting , TIG , MIG welding and resistance process.
CO-4	Gain knowledge on sheet metal cutting and operations, extrusion.
CO-5	Understand the fabrication methods of plastics using injection and blow moulding.
Course outcomes for Third Year First Semester Course	
Course Code:19130501	
Course Title: Design of Machine Members	
CO-1	Describe the concepts of basic machine elements.
CO-2	Identify the preferred sizes, codes and selection of proper material for design of machine element
CO-3	Design the machine element under static and dynamic loading conditions.
CO-4	Choose the temporary and permanent joints required to assemble the machine elements.
CO-5	Suggest the required spring for the given application.
Course Code:19130502	
Course Title: Thermal Engineering -II	
CO-1	Analyze the thermal power plants and different methods to improve plant efficiency.
CO-2	Evaluate the performance of various steam nozzles.
CO-3	Examine various efficiencies of Condensers and steam turbines.
CO-4	Discuss gas turbines working principle and different methods to improve thermal efficiencies of gas

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	turbines.
CO-5	Choose optimal parameters of jet propulsion units.
Course Code:19130503	
Course Title: Metal Cutting & Machine Tools	
CO-1	Explain the cutting tool geometry, chip formation and cutting forces.
CO-2	Describe the various parts and operations of machine tools viz. lathe, shaper, planer, drilling, boring, milling, grinding and broaching machine.
CO-3	Identify various machine tools viz. lathe, shaper, planer, drilling, boring, milling and grinding machine for various applications.
CO-4	Discuss various principles and applications of jigs and fixtures .
CO-5	Explain the working principles o fvarious Non Traditional Machining.
Course Code:19130564A	
Course Title: A. Fuels Combustion and Emission control	
CO-1	Describe various types of fuels, combustion equations, adiabatic flame temperature and pollutant concentration.
CO-2	Examine various properties of fuels and their analysis.
CO-3	Identify the various factors responsible for laminar and turbulent flame propagation.
CO-4	Use different principles of flame stabilization and ignition to design combustor.
CO-5	Categorize emissions associated with combustion and identify their control techniques.
Course Code:19130564B	
Course Title: B. Tribology	
CO-1	Describe the viscosity and laws of fluid flow with reference to lubrication.
CO-2	Examine hydrodynamic and hydrostatic properties of lubricants.
CO-3	Explain the journal and slider bearings under different load carrying conditions.
CO-4	Describe the oil flow through bearings under different pressures and with thermal equilibrium conditions.
CO-5	Analyze the behaviour of tribological components and measures subjected to different working conditions.
Course Code:19130564C	
Course Title: C. Industrial Robotics	
CO-1	Discuss the fundamental components and coordinate systems of different industrial robots.
CO-2	Explain different types of drives used in robots and end effectors.
CO-3	Solve the mathematical formulation for robot link movement.
CO-4	Analyze the kinematics of robot arm.
CO-5	Identify the robot for different industrial applications with suitable robot programming.
Course Code:19130564D	
Course Title: D. Advanced Materials	
CO-1	Discuss the composites and their classification.
CO-2	Describe polymer composites and their manufacturing methods.
CO-3	Analyze the mechanical behaviour of composite laminates.
CO-4	Investigate properties and applications of functionally graded materials and shape memory alloys.

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CO-5	Explain the properties, applications of nano materials and bio materials.
Course Code:19131565a	
Course Title: Solid Waste Management	
CO-1	Under the objects of solid waste management
CO-2	Under the elements of solid waste management
CO-3	Design the transportation facility in solid waste management
CO-4	Characterize the solid waste and design a composting facility
CO-5	Know the criteria for selection of landfill
Course Code:19132565a	
Course Title: Energy management	
CO-1	The students shall have an understanding of the impact of energy on society
CO-2	The need for sustainable energy ,global and Indian energy policies
CO-3	They would have gained knowledge on various techniques of energy management and conservation
CO-4	They would also have gained the basic ideas of conducting an energy audit
Course Code:19134565a	
Course Title: Digital Image Processing	
CO-1	Understand the fundamental steps in digital image processing
CO-2	Examine various types of images ,intensity transformations and spatial filtering
CO-3	Develop fourier transform for image processing in frequency domain
CO-4	Evaluate the methodologies for image restoration and segmentation
CO-5	Understand colour image processing models
Course Code:19135565a	
Course Title: Information Security	
CO-1	Evaluate vulnerability of an information system and establish a plan for risk management
CO-2	Demonstrate basic principles of web application security
CO-3	Evaluate the authentication and encryption needs of an information system
CO-4	Demonstrate how to secure any work and evaluate a company's security policies and procedures
Course Code:19136565a	
Course Title: Disaster Management in Mining	
CO-1	Comprehend the concepts of hazard and disaster management
CO-2	Assess the types of hazards and their consequences
CO-3	Comprehend then approaches and measures in disaster management
CO-4	Comprehend the statutory provisions related to disaster management in india
Course Code:19137565a	
Course Title: Hybrid and Electric Vehicles	
CO-1	Operate of fuel cell technology
CO-2	Identification of fuel based vehicles

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CO-3	Determination of hybrid electric technology and electronic drive trains
CO-4	Construction of hybrid electric vehicles
CO-5	Construction of hybrid electric vehicle technology
Course Code:19193511	
Course Title: Theory of Machines Lab	
CO-1	Assess the gyroscopic effect and angular displacement of cam follower.
CO-2	Analyze the characteristic curves of different governors.
CO-3	Illustrate about different types of gears andfour bar mechanism.
CO-4	Evaluate simple and compound screw jack.
CO-5	Analyze different types of vibration systems and spring mass systems.
Course Code:19193512	
Course Title: Machine Tools Lab.	
CO-1	Perform step and taper turning, thread cutting, knurling and boring operations on cylindrical work pieces using lathe machine.
CO-2	Produce prismatic parts with desired surface finish using surface grinding machine and tool angles using tool and cutter grinder machine.
CO-3	Perform indexing to machine spur gears on milling machine.
CO-4	Execute sequence of operations on slotting and shaping machines to generate keyways and splines on the given work piece.
CO-5	Carry out drilling and tapping operations to produce desired hole pattern on the given job.
Course Code:19139513	
Course Title: Soft Skills	
CO-1	Understand the necessity to improve four language skills
CO-2	Acquire knowledge about public speaking ability
CO-3	Strengthen their grammatical skills in the language
CO-4	Improve necessary vocabulary and academic writing skills
CO-5	Improve academic writing skills
Course outcomes for Third Year Second Semester Course	
Course Code:19130601	
Course Title: Design of Transmission Elements	
CO-1	Find required sizes of shaft, keys and couplings for the given application.
CO-2	Identify a suitable bearing for the given application.
CO-3	Design of gear for a given application.
CO-4	Design of suitable I.C. engine parts for a given application.
CO-5	Suggest suitable flexible elements required to transmit the desired power.

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Course Code:19130602	
Course Title: Industrial Engineering & Management	
CO-1	Describe the various concepts of management techniques.
CO-2	Identify a suitable plant location and layout by considering various industrial aspects.
CO-3	Use work study concepts to improve productivity.
CO-4	Apply the suitable quality management techniques.
CO-5	Assess the project duration and crashing of any network problems.
Course Code:19130603	
Course Title: Heat Transfer	
CO-1	Explain the basic concepts of heat transfer.
CO-2	Solve the problems involving steady state and transient heat conduction in simple geometries.
CO-3	Analyze the forced and free convective heat transfer through various systems.
CO-4	Analyze the performance of heat exchangers and evaporators using boiling and condensation principles.
CO-5	Illustrate the real time applications of radiation heat transfer.
CO-1	Explain the basic concepts of heat transfer.
Course Code:19130604	
Course Title: Metrology and Instrumentation	
CO-1	Examine the tolerances, limits and fits of engineering components.
CO-2	Describe linear, angular measuring instruments comparators and limit gauges.
CO-3	Discuss surface roughness, gear and screw thread measurements.
CO-4	Explain instruments for measurement of displacement, temperature, pressure, speed and flow parameters.
CO-5	Use instruments for measurement of stress and strain, fluid flow ,torque and power.
CourseCode:19130665A	
Course Title: Refrigeration and Air Conditioning	
CO-1	Describe the concepts and applications of refrigeration systems.
CO-2	Compare & contrast the performance of vapour compression and absorption refrigeration system.
CO-3	Explain steam jet refrigeration system and their components.
CO-4	Discuss various refrigerants and components used in refrigeration plants.
CO-5	Classify air conditioning systems and assess their performance.
Course Code:19130665B	
Course Title: Mechatronics	
CO-1	Discuss the key elements of mechatronic system.
CO-2	Outline various sensors and actuators for an engineering application.
CO-3	Describe various microprocessors and microcontrollers.
CO-4	Use appropriate microprocessor and microcontroller for interfacing sensors, actuators and other

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	mechatronic elements.
CO-5	Construct PLC program and implementation of real life systems.
Course Code:19130665C	
Course Title: Advanced Foundry and Welding Technology	
CO-1	Describe various moulding techniques.
CO-2	Explain the principles of solidification and melting.
CO-3	Apply the knowledge of solid state welding process for engineering applications.
CO-4	Discuss the various advanced welding techniques.
CO-5	Identify the optimal welding process parameters for any welded joint.
Course Code:19130665D	
Course Title: Non Destructive Evaluation	
CO-1	Compare destructive testing and non destructive evaluation methods.
CO-2	Discuss working principle and construction details of magnetic particle, liquid penetrant and eddy current test.
CO-3	Explain the working principle and construction details and methods of ultrasonic test.
CO-4	Describe the working principle and construction details and methods of radiography test.
CO-5	Plan the suitable NDE methods based on the required application.
Course Code:19131666a	
Course Title: Global Environment Problems & Policies	
CO-1	To understand core concepts and methods from ecological and physical sciences and their application in environmental problem-solving
CO-2	To reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex , interconnected world
CO-3	To appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems
CO-4	To know environmental laws and grasp the concept of environmental legislation and its applications in international environmental agreement
CO-5	To appreciate the concern of environmental agreement
CourseCode:19132666a	
Course Title: Renewable Energy Resources	
CO-1	Analyze solar radiation data, extra terrestrial radiation on earths surface
CO-2	Design solar thermal collections
CO-3	Develop maximum power point techniques in solar PV and wind
CO-4	Compare solar ,wind and bio energy systems , their prospects ,advantages and limitations
Course Code:19134666a	
Course Title: c. Data Communication	
CO-1	Understand and explain data communication system and its components

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CO-2	Enumerate the layers of the OSI model and TCP/IP and explain functions of each layer
CO-3	Apply error detection and correction techniques to determine the error rate
CO-4	Identify the different types of network topologies and protocols
CO-5	Familiarity with the basic wireless networks , and how they can be used to assist in network design and implementation
Course Code:19135666a	
Course Title:. Human Computer Interaction	
CO-1	Explain the capabilities of both humans and computers from the view point of human information processing
CO-2	Describe typical human computer interaction models , styles, and various historic HCI paradigms
CO-3	Apply an interactive design process and universal design principles to designing HCI systems
Course Code:19136666a	
Course Title: Remote sensing & GIS in Mining	
CO-1	Outline the basic principles of remote sensing
CO-2	Develop the concepts of visual and digital image analysis
CO-3	Summarize the basic concepts of GIS
CO-4	Perform spatial analysis
CO-5	Apply knowledge of remote sensing and GIS in various fields
Course Code:19137666a	
Course Title: Modern Vehicle Technology	
CO-1	Design and develop modern vehicles
CO-2	Analyse and control the exhaust emissions and noise
CO-3	Analyse the vehicle operation and incorporate and develop the electronic control systems
CO-4	Distinguish and choose the fuel injection system
CO-5	Classify the design analysis of injection systems
Course Code:19139687	
Course Title: Constitution of India	
CO-1	Understand historical background of the constitution making and its importance for building a democratic india
CO-2	Understand the functioning of three wings of the government ie, executive, legislative and judiciary
CO-3	Understand the value of the fundamental rights and duties for becoming good citizen of India
CO-4	Analyze the decentralization of power between central ,state local self government
CO-5	Apply the knowledge un strengthening of the constitutional institutions like CAG, election commission and upsc for sustaining democracy

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Course Code:19130611	
Course Title: Heat Transfer Lab	
CO-1	Evaluate the conduction, convection and radiation heat transfer through experiments.
CO-2	Analyze the problems involving steady state and transient heat conduction in simple geometries.
CO-3	Evaluate heat transfer coefficients for natural convection and forced convection.
CO-4	Estimate the LMTD of heat exchanger.
CO-5	Evaluate the Stefan Boltzmann constant and emissivity of different bodies in radiation.
Course Code:19130612	
Course Title: Metrology and Instrumentation Lab	
CO-1	Measure the linear and angular dimensions of components using vernier calipers, outside micrometers , bevel protractor, sine bar and transducers etc.
CO-2	Assess the accuracy and errors of measuring instruments.
CO-3	Check the machine tool alignment using dial indictors and spirit level.
CO-4	Calibrate instruments to measure fluid flow, temperature, speed, pressure and displacement.
CO-5	Investigate the vibration parameters using micrometers.
Course outcomes for Fourth Year First Semester Course	
Course Code:19130701	
Course Title: Finite Element Methods	
CO-1	Illustrate the concepts behind variation and weighted residual methods in FEM.
CO-2	Analyze the applications and characteristics of finite element modelling.
CO-3	Investigate element characteristic equation and generate global stiffness matrix.
CO-4	Apply suitable boundary conditions to a global structural matrix equation and reduce it to solvable form.
CO-5	Identify an appropriate FEM approach to solve problems involving dynamics and heat transfer.
Course Code:19130702	
Course Title: CAD/CAM	
CO-1	Explain the basic concepts of CAD and Computer graphics.
CO-2	Solve the mathematical models to represent various geometries.
CO-3	Compose the part programs for engineering components.
CO-4	Explain the concepts of Group Technology and Computer Aided Quality Control.
CO-5	Discuss the elements of Flexible Manufacturing Systems and Computer Integrated Manufacturing .
Course Code:19130763A	
Course Title: Power Plant Engineering	
CO-1	Illustrate various power plant layouts and their working principles.
CO-2	Describe various elements involved in different power plants.
CO-3	Explain Nuclear power plants with various reactors.
CO-4	Analyze various combined plants and find importance of measurement of pollutants.
CO-5	Evaluate economic parameters and pollutants and their prevention.

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Course Code: 19130763B	
Course Title:. Mechanical Vibrations	
CO-1	Apply the knowledge regarding various moulding techniques.
CO-2	Explain the principles of Solidification and melting.
CO-3	Describe the knowledge of solid state welding process for engineering applications.
CO-4	Identify radiant beam welding methods.
CO-5	Assess the destructive and non destructive testing of welds.
Course Code:19130763C	
Course Title: Automobile Engineering	
CO-1	Describe various functional components of an Automobile.
CO-2	Explain engine auxiliary systems used in SI and CI engine.
CO-3	Examine ignition and electrical systems in Automobiles.
CO-4	Compare manual transmissions systems with automatic transmission systems.
CO-5	Illustrate the working of steering, braking and the suspension systems.
Course Code:19130763D	
Course Title: Advanced Machining Processes	
CO-1	Select suitable surface treatment technique for any given application.
CO-2	Describe working principles of mechanical energy based non traditional machining processes.
CO-3	Discuss different electro chemical and discharge machining processes and also their applications.
CO-4	Describe working principles and applications of IBM, LBM, EBM and PAM.
CO-5	Explain various manufacturing techniques of powder metallurgy.
Course Code:19130764A	
Course Title: Gas Dynamics & Jet Propulsions	
CO-1	Solve basic problems of thermodynamics and fluid mechanics.
CO-2	Solve fluid flow problems through ducts with and without heat flow including friction.
CO-3	Analyze the change in flow properties across shock waves in different flow regions.
CO-4	Examine performance of jet propulsion engines.
CO-5	Find the performance of Rocket engines using principles of gas dynamics.
Course Code:19130764B	
Course Title: Micro Electro Mechanical Systems	
CO-1	Describe the working principles of micro-sensors and actuators.
CO-2	Explain the application of scaling laws in the design of micro systems.
CO-3	Identify the typical materials used for fabrication of micro systems.
CO-4	Discuss the principles of standard micro fabrication techniques.
CO-5	Analyze various micro electro mechanical systems and their construction.
Course Code:19130764C	
Course Title: Design for Manufacturing	
CO-1	Explain the design philosophy and manufacturability of a product.

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CO-2	Investigate machining and casting processes from design perspective.
CO-3	Identify the design principle sin extrusion, sheet metal and welding.
CO-4	Infer design aspects in forging and manufacturing of plastics.
CO-5	Summarize the design considerations in manual and automatic assembly process.
Course Code:19130764D	
Course Title:. Automation in Manufacturing	
CO-1	Discuss the different fundamental concepts of automation and its tools.
CO-2	Analyze the automated flow lines &line balancing methods.
CO-3	Classify the automated material handling, automated storage and retrieval systems in industries.
CO-4	Explain the working of adaptive control systems for temperature, vibration, forces etc.
CO-5	Describe various automated inspection methods.
Course Code:19139765a	
Course Title: Managerial Economics and Financial Analysis	
CO-1	Analyze the scope of managerial economics
CO-2	Analyse various aspects of managerial economics production ,cost analysis , markets and pricing strategies
CO-3	Develop an ability to identify formulate and solve engineering problems by applying the subject knowledge of managerial economics
CO-4	Apply capital budgeting financial analysis techniques in evaluating various investments opportunities
CO-5	Enhance their capabilities in the interpretation of balance sheets are followed in industries
Course Code:19139765b	
Course Title:. Entrepreneurship Qualities for Engineers	
CO-1	Can know the importance of entrepreneurship in economic developments, ethics and its social responsibilities
CO-2	Can understand the business plan its scope implementation in marketing
CO-3	Can able to know the finance resources motivation marketing and internet advertising
CO-4	Can understand the problems related to selection of layout
CO-5	Can know the production techniques, inventory and quality control in global aspects
Course Code:19139765c	
Course Title: Principles of Management	
CO-1	Gain the knowledge of basic concepts tested principles emerging ideas evolving theories and latest techniques
CO-2	Understand the importance of critical decisions that ensure growth and sustainability of the organization
CO-3	Understand theoretical aspects and its application to modern management practice
CO-4	Demonstrate critical thinking when presented with managerial issues and problems
CO-5	Understand the importance of professional management for effective utilization of resources in organizations

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CourseCode:19139765d	
Course Title: Financial Management for Engineers	
CO-1	The students would be able to understand and define Basie terminology used in finance and accounts
CO-2	The students would be able to prepare& appraise Financial Statements and evaluate a company in the light of different measurement systems
CO-3	The students would be able to analyse the risk and return of alternative sources of financing.
CO-4	Estimate cash flows from a project, including operating, net working capital, and capital spending.
CO-5	To estimate the required return on projects of differing risk. to estimate the cash flows from an investment project. calculate the appropriate discount rate, and determine the value added from the project, and make a recommendation to accept or reject the project
Course Code:19139765e	
Course Title: Operations management	
CO-1	Are able to understand the basic concepts in operations and production activities
CO-2	Can identify the factors influencing plant location and plant layout
CO-3	Can identify the production process and execute the customer order timely
CO-4	Can manage the materials manpower effectively by using appropriate inventory and time study techniques
CO-5	Can improve the productivity by using effective quality control standards and techniques
Course Code:19139765f	
Course Title: Digital Marketing	
CO-1	Would be able to learn about model approach of marketing
CO-2	Would be able to learn various methods and channels of digital marketing
CO-3	Would be introduced to digital marketing planning execution
CO-4	Get concepts of sees introduced for the benefit of students aspiring start-ups
CO-5	Can learn advertising strategies of digital marketing have been introduced
Course Code:19139765g	
Course Title: Total Quality Management	
CO-1	To realize the importance of significance of quality
CO-2	Manage quality improvement teams
CO-3	Identify requirements of quality improvement programs
CO-4	Develop a thinking towards quality systems and thinking
CO-5	Acknowledge the strategic value of leading practices and therefore their implementation efficiently designing the effective performance measurement system
Course Code:19139765h	
Course Title: Organizational Behaviour	
CO-1	Understand the basic concepts in organizational behaviour

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CO-2	Protect the cause and effect relationship of the people in a work place
CO-3	Understand the group behaviour and its impact on work performance and organization
CO-4	Understand the managerial strategies in achieving the goals of organizations
CO-5	Improve the results-performance outcome through human behaviour and organizational behaviour can aid them in their pursuit of the goals
Course Code19139765i	
Course Title: Human Resource Management	
CO-1	Integrated perspective on role of hrm in modern business. Ability to plan human resources and implement techniques of job design
CO-2	Can conduct job analysis and scientific recruitment and selection process for the higher productivity
CO-3	Can get competency to recruit train and appraise the performance of employees
CO-4	Can learn rational design of compensation and salary administration
CO-5	Are able to handle employee issues and evaluate the new trends in hrm
Course Code:19139786	
Course Title: Intellectual Property Rights and Patents	
CO-1	To understand the concepts of intellectual property rights
CO-2	Develops procedural knowledge to Legal System and solving the problem relating to intellectual property rights.
CO-3	Skill to pursue the professional programs in Company Secretary ship, Law, Business International Affairs, Public Administration and Other fields.
CO-4	Employability as the Compliance Officer, Public Relation Officer and Liaison Officer.
CO-5	Establishment of Legal Consultancy and service provider. cyber crime
Course Code:19130711	
Course Title: CAD/CAM Lab	
CO-1	Analyze various types of 2D and 3D trusses by static and dynamic analysis using ANSYS.
CO-2	Solve the static problems involving corner bracket and cylinder components.
CO-3	Examine the beams with various end conditions subjected to static load.
CO-4	Analyze various thermal properties of bodies with different geometries.
CO-5	Compose NC code for turning and pocket milling operations.
Course outcomes for Fourth Year second Semester Course	
Course Code:19139801	
Course Title: Operations Research	
CO-1	Describe the various operations research models and their applications.
CO-2	Solve the various engineering and managerial problems of LPP, transportation, assignment, sequencing and replacement.
CO-3	Apply game theory in different competitive situations.
CO-4	Solve the problems related to theories of waiting line and inventory models
CO-5	Apply the principles of dynamic programming and simulation framework to solve various decision making situations.

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Course Code:19130862A	
Course Title:. Computational Fluid Dynamics	
CO-1	Identify different application of CFD.
CO-2	Analyze governing equations of fluid dynamics using CFD.
CO-3	Examine the behaviour of hyperbolic, parabolic and elliptic equations by using explicit and implicit approaches.
CO-4	Evaluate the transformed governing equations using boundary conditions.
CO-5	Asses the linear 3D FVD schemes in fluid flow problems.
Course Code:19130862B	
Course Title: B. Nano Technology	
CO-1	Discuss the applications of nano materials in engineering and few other fields.
CO-2	Describe the mechanical, electrical, thermal and physical properties of nano materials.
CO-3	Explain the synthesis and fabrication techniques of nano particles.
CO-4	Discuss the uses of characterization techniques such as spectroscopy, SEM, TEM and XRD.
CO-5	Describe carbon nano technology and its various applications.
Course Code:19130862C	
Course Title: Additive Manufacturing	
CO-1	Discuss the applications of nano materials in engineering and few other fields.
CO-2	Describe the mechanical, electrical, thermal and physical properties of nano materials.
CO-3	Explain the synthesis and fabrication techniques of nano particles.
CO-4	Discuss the uses of characterization techniques such as spectroscopy, SEM, TEM and XRD.
CO-5	Describe carbon nano technology and its various applications.
Course Code:19130862D	
Course Title: Production Planning and Control	
CO-1	Explain the elements of production planning and control.
CO-2	Investigate various forecasting techniques for manufacturing and service sectors.
CO-3	Use the appropriate inventory model for various industrial circumstances.
CO-4	Create the optimized route and schedule for the product to achieve the desired objectives.
CO-5	Discuss the dispatch and control activities for production process, and factory physics.
Course Code: 19130841	
Course Title: Project Work	
CO-1	Research relevant and reliable literature to evaluate the state of the field.
CO-2	Undertake problem identification, formulation and solution.
CO-3	To allow students to develop problem solving, analysis, synthesis and evaluation skills.
CO-4	Deliver presentations that are required as engineers.

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GR-19 B.Tech Electronics & Communication Engineering

B.TECH–ELECTRONICS and COMMUNICATION SENGINEERING

Department Vision :

Create an educational environment to mound the students to meet the challenges of modern Electronics & Communication industry through state of the art Technical knowledge and Innovative experimental Approaches.

Department Mission:

1. To create learning, development and testing environment to meet ever challenging needs of the Electronic industry
2. TocreateentrepreneurialenvironmentandindustryInteractionforMutualbenefit
3. Tobecomeaglobalpartnerintraininghumanresourcesinthefieldsofchipdesign, instrumentation and networking
4. To associate with internationally reputed Institutions for Academic excellence and collaborative Research

Program Educational Objectives(PEOs) :

PEO1	To prepare students with excellent comprehension of basic Sciences, mathematics and engineering subjects facilitating them to gain employment or pursue postgraduate studies with an appreciation for lifelong learning.
PEO2	To train students with problem solving capabilities such as analysis and design with adequate practical skills wherein they demonstrate creativity and innovation that would enable them to develop state of the art equipment and technologies of multidisciplinary nature for societal development.

Program Specific Outcomes(PSO's):

PSO1	Analyze and design analog and digital circuits or systems for a given specification and function.
PSO2	Implement functional blocks of hardware-software co-designs for signal processing and communication applications.

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Program Outcomes (POs):Engineering Graduates will be able to:

1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigation of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety ,legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics:** Apply ethical principles and committo profession alethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multi disciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehendandwriteeffectivereportsanddesigndocumentation,makeeffectivepresentations, And give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
12	**Life-longlearning:**Recognizetheneedfor,andhavethepreparationandabilitytoengage in independent and life-long learning in the broadest context of technological change.

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Course out comes (Cos)of all courses of all programs offered by the institution

Course Out comes for First Year First Semester Course	
CourseCode:19199101	
Course Title :Mathematics-I	
CO-1	Transform the knowledge of solving system of linear equations using matrices.
CO-2	Apply mean value Rolls, Lagranges and Cauchy mean value theorem in engineering applications.
CO-3	Acquire the knowledge maxima and minima of function of several variables
CO-4	Evaluate multiple integrals and their applications
CourseCode:19199102	
Course Title :Communicative English-I	
CO-1	students will be able to develop effective reading strategies
CO-2	will be able to demonstrate writing skills that are required for professional development and use graphic elements for communication
CO-3	will be able to apply grammatical skills and vocabulary effectively in speech and writing
Course code:19199103	
Course Title: Engineering Physics	
CO-1	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics.
CO-2	To interpret dielectric loss, Lorentz field and Claussius- Mosotti relation and classify the magnetic materials based on susceptibility and their temperature dependence .To apply the Gauss' Theorem for divergence and Stokes' Theorem for curl and evaluate Maxwell's displacement current and correction in Ampere's law
CO-3	To assess the electromagnetic wave propagation in different media and its power and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors.
CO-4	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.
Course code:19199104	
Course Title: Problem Solving & Programming in C	
CO-1	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO-2	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO-3	Develop program by using Control structure, different looping and Jump statement.
CO-4	Implement applications of Array, Structure and String inside the program. Also acquire the knowledge of different FILE operations.
Coursecode:19193175	
CourseTitle:Engineering Graphics	
CO-1	CO1: Apply principles of drawing to represent dimensions of an object
CO-2	Outline the polygons and engineering curves
CO-3	Illustrate projections of point, lines planes and solids
CO-4	Illustrate 3D views though isometric views
CO-5	Create the isometric views and orthographic views
Course code:19199112	
Course Name: Engineering Physics Laboratory	
CO-1	To handle optical instruments like microscope and spectrometer, determine thickness of a hair/paper with the concept of interference and to estimate the wavelength and resolving power of different colors using diffraction grating.

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C0-2	To demonstrate the importance of dielectric material in storage of electric field energy in the capacitors and plot the intensity of the magnetic field of circular coil carrying current with varying distance
Course code:19199111	
Course Name: Communicative English Laboratory-I	
CO-1	Learning to communicate in English.
CO-2	Comprehend native speakers accent.

Course Outcomes for First Year Second Semester Course	
Course Code:19199201a	
Course Title: Mathematics-II	
CO-1	Apply the knowledge of descriptive statistics and method of data science in practical engineering problems.
CO-2	Apply the Knowledge of Probability in practical Engineering problems
CO-3	Demonstrate the knowledge of Probability distributions.
CO-4	Enhance knowledge in Sampling & Estimation techniques.
CO-5	Enhance Knowledge in Design of Experiments.
Course Code:19199202	
Course Title: Communicative English-II	
CO-1	Paraphrase short academic texts using suitable strategies and conventions
CO-2	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
CO-3	Build the ability to convey in different communicative forms.
Course code:19199203	
Course Title: Applied Chemistry	
CO-1	Compare different types of cells
CO-2	Explain the merits of fuel cells
CO-3	List various sources of renewable energy
CO-4	Distinguish between polymers and plastics
CO-5	Distinguish between nano clusters & nano wires, polymers
Course code:19192204	
Course Title: Basic Electrical & Electronics Engineering	
CO-1	Analyze the various electrical networks
CO-2	Understand the operation of DC machines,3-point starter and conduct the Swinburne's Test.
CO-3	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
CO-4	Analyze the operation of half Wave, full wave rectifiers, op-amps.
Course Outcomes for Second Year first Semester Course	
Course Code:19142302	
Course Title :Network Analysis	
CO-1	Analyze network, network topology and various network reduction techniques
CO-2	Understand AC fundamentals, steady-state analysis of AC circuits, magnetic circuits and resonance concept.
CO-3	Apply network theorems to both DC and AC networks and know about various two port network

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	parameters.
Course Code:19140303	
Course Title: Electronic Devices & Circuits	
CO-1	Apply the Knowledge of semiconductor physics for designing the circuits of electronic devices.
CO-2	Obtain the characteristics of diode in forward and reverse bias and perform Mathematical modeling of diode as a resistor and capacitor.
CO-3	Perform analysis and design of a complete AC to DC converter consisting of rectifiers, filters and regulators.
C0-4	Describe the construction and working of a transistor in various modes and design circuits for stabilization and compensation of both BJT and FET.
CO-5	Gain knowledge of small signal low frequency transistor amplifier models.
Course code:19140304	
Course Title: Switching Theory & Logic Design	
CO-1	Represent numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.
CO-2	Realize Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
CO-3	Design and analyze combinational circuits and to use standard combinational functions/building blocks to build complex circuits.
CO-4	Design and analyze sequential circuits and devices and to use standard sequential functions/building blocks to build complex circuits.
CO-5	Design and analyze finite state machine.
Course code: 19140305	
Course Title: Signals and Systems	
CO-1	Characterize and analyze the properties of CT and DT signals that are commonly used in engineering applications.
CO-2	Analyze the spectral characteristics of continuous-time periodic and aperiodic signals using Fourier analysis
CO-3	Classify systems based on their properties and determine the response of LTI system using convolution
CO-4	Understand the process of sampling and the effects of under sampling.
CO-5	Apply the Laplace transform and Z-transform to analyze continuous-time and discrete-time signals and systems.
Course Outcomes for Second Year Second Semester Course	
CourseCode:19140403	
Course Title: Electronic Circuit Analysis	
CO-1	Perform analysis and design of Small Signal Transistor Amplifier models.
CO-2	Perform analysis of high frequency response of BJT and FET.
CO-3	Demonstrate the knowledge of multistage amplifier and differential amplifier using BJT
CO-4	Analyze the concepts of both positive and negative feedback in electronic circuits and to generate signals in various frequency ranges.
CO-5	Design different types of power amplifiers for real time applications
Course Code:19140404	
Course Title: Analog Communications	
CO-1	Relate modulation, demodulation techniques and understand major building blocks of communication systems.

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CO-2	Understand the communication systems and distinguish between different modulation techniques.
CO-3	Analyze generation and detection of FM signals in both time domain and frequency domains and Learn about less noise immune systems..
C0-4	Sample analog signals and understand multiplexing of signals.
CO-5	develop a clear insight into the relations between the input and output AC signals in various stages of a transmitter and receiver of AM and FM systems.
Course code:19140411	
Course Title: Electronic Circuit Analysis Lab	
CO-1	Perform analysis and design of Small Signal Transistor Amplifier models.
CO-2	Design and analysis of feedback amplifiers and oscillators
CO-3	Demonstrate the knowledge of multistage amplifier and differential amplifier using BJT.
CO-4	Design and analysis of different types of power amplifiers
CO-5	Design different types of tuned amplifiers for real time applications
Course code:19140413	
Course Title: Analog Communication Lab	
CO-1	Identify and describe different Amplitude modulation techniques
CO-2	Identify and applying Emphasis techniques in analog systems
CO-3	Sample analog signals
CO-4	Analyze different discrete pulse modulation techniques Analyze different discrete pulse modulation techniques
CO-5	Understand and Simulate the different codes using MATLAB
Course Outcomes for Third Year First Semester Course	
Course Code:19140503	
Course Title: Linear & Digital IC Applications	
CO-1	Understand the internal operation of Op-Amp and its specifications.
CO-2	Analyze and design linear and nonlinear applications using Op-Amp.
CO-3	Operate 555 timers in different modes like be stable, monostable and as table operations and study their applications.
CO-4	Understand the conversion process of ADC and DAC in digital electronics.
CO-5	Explain the differences between CMOS and TTL logic families and study various digital ICs.
Course Code: 19140504	
Course Title: Digital Communication	
CO-1	Explain the conventional digital communication system.
CO-2	Discuss the pulse digital modulation schemes such as PCM, DPCM and DM.
CO-3	Evaluate the performance of various digital modulation techniques in terms of probability of error
C0-4	Analyze the performance of digital communication system in the presence of noise
CO-5	Compute and analyze block codes, cyclic codes and convolution codes.
Course code: 19140505	
Course Title: Antenna and Wave Propagation	
CO-1	Acquire knowledge of basic antenna parameters.

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CO-2	Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas, and micro-strip antennas.
CO-3	Analyze the fields radiated by various types of antennas.
CO-4	Analyze antenna arrays.
CO-5	Analyze antenna measurements to assess antenna's performance.
Course code:19140511	
Course Title: Linear IC Applications Laboratory	
CO-1	Design and implementation of Filter circuits using IC 7
CO-2	Analyze the functionality of Multi vibrator circuits using IC 555
CO-3	Work in teams to design amplifier circuits using IC 741
CO-4	Design and analyze A/D and D/A converters
CO-5	Design and perform voltage regulation using IC 723
Course Outcomes for Third Year Second Semester Course	
Course Code:19144602	
Course Title: Computer Networks	
CO-1	Understand the fundamental principles of computer networks and various reference models
CO-2	Identify the different types of network topologies and protocols.
CO-3	Understand and explain Data Communications System and its components.
CO-4	Understand and building the skills of sub netting and routing mechanisms.
CO-5	Identify the different types of network devices and their functions within a network
Course Code: 19144603	
Course Title: Microprocessors and Microcontrollers	
CO-1	Learn architectural difference between Microprocessor and Microcontroller and its need for development of products and product development procedure.
CO-2	Learn of RAM and ROM memory interfacing concepts and address calculations
CO-3	Apply concepts of programming in Assembly Language and Embedded C programming
C0-4	Analyze the concepts of Input / Output port Interfacing of microcontroller.
CO-5	Apply concepts of serial and parallel communication methods to various sensors
Course code:19144604	
Course Title: Digital Signal Processing	
CO-1	Interpret, represent and process discrete/digital signals and systems.
CO-2	Understand frequency domain analysis of discrete time signals and systems using DTFT, DFT and FFT.
CO-3	Design and implement FIR and IIR filters using different methods, and how to test, analyze and refine design.
CO-4	Realize the basic structures of FIR and IIR systems.
CO-5	Acquire the basics of multi rate digital signal processing.
Course Outcomes for Fourth Year First Semester Course	
Course Code:19140702	
Course Title: VLSI Design	
CO-1	Analyze the fabrication process of CMOS digital circuits.

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CO-2	Apply the concept of design rules during the layout of a circuit.
CO-3	Analyze the architectural issues of subsystem design.
CO-4	Implement circuit through various design styles (Semi-Custom, Full Custom).
CO-5	Apply the clock mechanism, demonstrate the architectural of FPGA.
Course Code: 19140703	
Course Title: Optical Communication	
CO-1	Demonstrate an understanding of optical fiber communication link, structure, propagation and transmission properties of an optical fiber.
CO-2	Estimate the losses and analyze the propagation characteristics of an optical signal in different types of fibers
CO-3	Describe the principles of optical sources and power launching-coupling methods
C0-4	Compare the characteristics of fiber optic receivers
CO-5	Design a fiber optic link based on budget and choose necessary components required in modern optical communication systems.
Course code: 19140706B	
Course Title: Embedded System Design	
CO-1	Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.
CO-2	Understand different I/O devices and peripherals used in embedded networking.
CO-3	Develop programming skills in embedded systems for various applications.
CO-4	Choose and operating system, and learn how to choose an RTOS.
CO-5	Acquire knowledge about Life cycle of embedded design and its testing.
CourseCode:19140706D	
Course Title: Wireless Sensor Networks	
CO-1	Identify major issues and challenges associated with wireless sensor networks.
CO-2	Identify the requirement of protocols for wireless ad-hoc networks as compared to the existing aired network.
CO-3	Explore network layer technologies by researching key areas such as algorithms, protocols, hardware, and applications.
CO-4	Discuss the concepts of transport layer protocols for wireless ad-hoc networks.
CO-5	Understand security requirements, Issues and Challenges involved in wireless ad-hoc networks.
Course Code:19140711	
Course Title: Microwave Engineering and Optical Communication Laboratory	
CO-1	Analyze the working of several microwave components
CO-2	Perform measurements with the microwave equipment
CO-3	Measure several waveguides, antenna related parameters and analyze the performance characteristics
Course Outcomes for Fourth Year Second Semester Course	
Course Code:19140802A	
Course Title: Radar System Engineering	
CO-1	Acquire the knowledge to apply and design required parameters for RADAR system.
CO-2	Analyze the working principle of CW and Frequency Modulated Radar
CO-3	Analyze the working principle of MTI and pulse Doppler Radar

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CO-4	Acquire the knowledge of different types of radars and radar trackers
CO-5	Acquire the knowledge about different types of radar receivers
Course Code:19140801C	
Course Title: Digital IC Design	
CO-1	Describe the concepts of MOS Devices and modeling.
CO-2	Design and analyze any Analog Circuits in real time applications
CO-3	Extend the analog circuit design to different applications in real time.
CO-4	Analyze of Open-loop comparators and different types of oscillators
CO-5	Design and analyze PLL ,Ring Oscillators and other Oscillators
Course Code: 1914084161	
Course Title: Project	
CO-1	Apply all levels of Engineering knowledge in solving the engineering problems.
CO-2	Work together with team spirit.
CO-3	Use civil engineering software atleast once
CO-4	Document the projects.

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GR-19 B.Tech Computer Science & Engineering

B. TECH – COMPUTER SCIENCE & ENGINEERING

Department Vision:

To be a center of academic excellence in the field of computer science and engineering education and research, to serve as a valuable resource for industry and society, maintaining the traditions and human values.

Department Mission:

M1: Providing the best educational facilities for training students for the careers in science and technology.

M2: Providing a creative atmosphere in which higher studies and research thrive both among the students and the faculty.

M3: Undertaking collaborative projects which offer opportunities for long-term interaction with academia and industry.

M4: Sensitization towards importance for ethical practice, societal responsibility, leadership, entrepreneurship, communication and lifelong learning.

Program Educational Objectives (PEOs):

PEO1	Applying the fundamentals of mathematical, scientific and engineering knowledge and skill for a successful career and/or
PEO2	Pursuing higher education and partaking in research activities and/or
PEO3	Undertaking entrepreneurship and leadership role to meet the needs of the society.

Program Specific Outcomes (PSO's):

PSO1	Applying knowledge of engineering practices and ethical policies in development and maintenance of software and hardware solutions for real-time problems
PSO2	Ability to pursue higher education and research.

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Program Outcomes (POs): Engineering Graduates will be able to:

1	**Engineering knowledge:** Apply knowledge of mathematics, science and engineering principles in solving problems related Computer Science and Engineering.
2	**Problem analysis:** Investigate, analyze and conduct experiments to establish cause and effect relationships.
3	**Design/development of solutions:** Demonstrate the abilities to design and develop algorithms and implement them to optimize the solution.
4	**Conduct investigations of complex problems:** Address the challenges of complex and computation-based problems to create innovative computing methods.
5	**Modern tool usage:** Adopt modern engineering tools or software's for analyzing and solving various computer science engineering problems.
6	**The engineer and society:** Understand the impact of social, cultural, ethical and global aspects in their professional practice.
7	**Environment and sustainability:** Understand the impact of professional engineering solutions for environmental sustainability.
8	**Ethics:** Exercise professional and ethical discretion.
9	**Individual and team work:** Visualize and work independently and in teams.
10	**Communication:** Communicate effectively.
11	**Project management and finance:** Employ knowledge of contemporary issues to various software engineering approaches for project management.
12	**Life-long learning:** Engage in lifelong learning

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Course outcomes (Cos) of all courses of Computer Science &Engineering

Program offered by the institution

Course Outcomes for First Year First Semester	
Course Code: 19199101	
Course Title: MATHEMATICS-1	
CO-1	Transform the knowledge of solving system of linear equations using matrices.
CO-2	Apply mean value Rolls, Lag ranges and Cauchy mean value theorem in engineering applications.
CO-3	Acquire the knowledge maxima and minima of function of several variables
CO-4	Evaluate multiple integrals and their applications
CO-5	Understand Beta and Gamma functions, evaluate improper integrals.
Course Code: 19199102	
Course Title: COMMUNICATIVE ENGLISH -1	
CO-1	students will be able to develop effective reading strategies
CO-2	will be able to demonstrate writing skills that are required for professional development and use graphic elements for communication
CO-3	will be able to apply grammatical skills and vocabulary effectively in speech and writing
Course Code: 19199103	
Course Title: APPLIED PHYSICS	
CO-1	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution
CO-2	To demonstrate the concept on the absorption and spontaneous and stimulated emission in two level system and the conditions for laser amplification and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics. and classify the magnetic materials based on susceptibility and their temperature dependence.
CO-3	To study the Schrödinger equation for standard systems with both analytical and numerical methods, and then interpret the results. And to explain the physical states of elementary particles and atoms in different systems based on quantum mechanics
CO-4	To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors
Course Code: 19199104	
Course Title: PROBLEM SOLVING & PROGRAMMING IN C	
CO-1	Obtain the knowledge about different languages used in computer programming and basic terminology used in the computer programming.
CO-2	Write algorithm, flow chart, and structure of C program and make use of different C tokens inside C program.
CO-3	Develop program by using Control structure, different looping and Jump statement.
CO-4	Implement applications of Array, Structure and String inside the program. Also acquire the knowledge of different FILE operations.
CO-5	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.
Course Code: 19193175	
Course Title: ENGINEERING GRAPHICS	
CO-1	Sketch engineering objects, lettering and dimensioning by freehand
CO-2	Apply orthographic projection method to obtain: Multi view, auxiliary view and section view of an object
CO-3	Create 2-D computer drawing setting up working space (units, grids etc.), creating and editing 2-D geometries
CO-4	Create 3-D computer drawing use industry-standard Computer Aided Design (CAD) software to model solid objects proceeding from basic sketching techniques to the creation of solid features through the use of extrusions, cuts, rotations, patterns and sweeps.
Course Code: 19199196a	
Course Title: ENVIRONMENAL STUDIES	
CO-1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.

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CO-2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO-3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO-4	**Recognize the interconnectedness of human dependence on the earth's ecosystems**
CO-5	Influence their society in proper utilization of goods and services.
Course Code: 19199111	
Course Title: COMMUNICATIVE ENGLISH LABORATORY-1	
CO-1	Learning to communicate in English
CO-2	Comprehend native speakers accent.
CO-3	Speak appropriately in real life situations
Course Code: 19199112	
Course Title: ENGINEERING PHYSICS LABORATORY	
CO-1	To handle optical instruments like microscope and spectrometer, determine thickness of a hair/paper with the concept of interference and to estimate the wavelength and resolving power of different colors using diffraction grating
CO-2	To demonstrate the importance of dielectric material in storage of electric field energy in the capacitors and plot the intensity of the magnetic field of circular coil carrying current with varying distance
CO-3	To evaluate the acceptance angle of an optical fiber and numerical aperture and determine the resistivity of the given semiconductor using four probe method
CO-4	To identify the type of semiconductor i.e., n-type or p-type using Hall effect and determine the band gap of a given semiconductor
Course Code: 19199113	
Course Title: PROBLEM SOLVING & PROGRAMMING LABORATORY USING C	
CO-1	Know concepts in problem solving.
CO-2	Analyze a problem and Implement programs in C language.
CO-3	Work with arrays, pointers and structures.
CO-4	Apply functions concepts for problem solving.
CO-5	Implement FILE operations for storage purpose.
Course Outcomes for First Year Second Semester	
Course Code: 19199201b	
Course Title: PROBABILITY & STATISTICS	
CO-1	**Apply the knowledge of descriptive statistics and method of data science in practical engineering problems.**
CO-2	**Apply the Knowledge of Probability in practical Engineering problems.**
CO-3	**Demonstrate the knowledge of Probability distributions.**
CO-4	**Enhance knowledge in Sampling & Estimation techniques.**
CO-5	**Enhance Knowledge in Design of Experiments.**
Course Code: 19199202	
Course Title: COMMUNICATIVE ENGLISH – II	
CO-1	Paraphrase short academic texts using suitable strategies and conventions
CO-2	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
CO-3	Build the ability to convey in different communicative forms.
Course Code: 19199203	
Course Title: APPLIED CHEMISTRY	
CO-1	Compare different types of cells
CO-2	Explain the merits of fuel cells
CO-3	List various sources of renewable energy
CO-4	Distinguish between polymers and plastics
CO-5	Distinguish between nano clusters & nanowires, polymers
Course Code: 19199204	
Course Title: Basic Electrical & Electronics Engineering	
CO-1	Analyze the various electrical networks
CO-2	Understand the operation of DC machines, 3-point starter and conduct the Swinburne's Test.
CO-3	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.

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CO-4	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO-5	Explain the single stage CE amplifier and concept of feedback amplifier.
Course Code: 19199206	
Course Title: Python Programming	
CO-1	Handle different data structures.
CO-2	understand the use of control statements, function overloading, operator overloading in real time application
CO-3	Implement files using various file operations.
Course Code: 19199211	
Course Title: Communicative English Laboratory-II	
CO-1	communicate confidently in English in social and professional contexts with improved skills of fluency and accuracy
CO-2	speak grammatically correct sentences employing appropriate vocabulary suitable to different contexts
CO-3	read for various scholarly materials for information and comprehension
Course Code: 19192212	
Course Title: Basic Electrical & Electronics Engineering Laboratory	
CO-1	Analyze the various electrical networks
CO-2	Understand the operation or DC machines,3 -point starter and conduct the Swinburne's Test.
CO-3	Analyze the performance oi transformer, operation of 3-phase alternator and 3-phase induction motors.
CO-4	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO-5	Explain the single stage CE amplifier and concept of feedback amplifier.
Course Code: 19195213	
Course Title: Python Programming Laboratory	
CO-1	Student should be able to understand the basic concepts scripting and the contributions of scripting language
CO-2	Ability to explore python especially the object-oriented concepts, and the built in objects of Python.
CO-3	Ability to create practical and contemporary applications such as TCP/IP network programming, Web applications, discrete event simulations
Course Code: 19199214	
Course Title: Engineering Chemistry Laboratory	
CO-1	Explain the functioning of the instruments such as pH, Conductivity and Potentiometric meters
CO-2	Determine the total hardness of water
CO-3	Perform various Redox titrations
CO-4	Preparation of polymers
CO-5	Compare viscosities of different oils
Course Outcomes for Second Year Third Semester	
Course Code: 19159301	
Course Title: Discrete Mathematics	
CO-1	Perform operations on discrete structures such as sets, functions, relations, and sequences.
CO-2	Apply algorithms and use definitions to solve problems to prove statements in elementary Number theory.
CO-3	Construct mathematical arguments using logical connectives and quantifiers.
CO-4	Verify the correctness of an argument using propositional and predicate logic and truth Tables.
CO-5	Explain basic definitions and properties associated with simple planar graphs, including Isomorphism, connectivity, and Euler's formula, and describe the difference between Eulerian and Hamiltonian graphs.
CO-6	Use graphs and trees as tools to visualize and simplify situations.
Course Code: 19150302	
Course Title: Object Oriented Programming Through C++	
CO-1	Describe the procedural and object-oriented paradigm with concepts of data abstraction, inheritance.
CO-2	Understand principles of virtual functions and polymorphism
CO-3	Describe the concept of exception handling

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CO-4	Use object-oriented programming techniques in a wide range of real time applications.
Course Code: 19150303	
Course Title: Digital Logic & Computer Organization	
CO-1	Minimize a Boolean function using Boolean algebra and K-Maps.
CO-2	Model a system as combinational switching circuit and analyze the applications of decoder, encoder, multiplexer and de-multiplexer.
CO-3	Model a sequential circuit and design various binary counters.
CO-4	Describe various addressing modes, instruction formats and program control statements.
CO-5	Recall the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components.
Course Code: 19150304	
Course Title: Data Structures	
CO-1	Choose appropriate data structure as applied to specified problem definition.
CO-2	Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
CO-3	Apply concepts learned in various domains like DBMS, compiler construction
CO-4	Use linear and non-linear data structures like stacks, queues, linked list etc.,
Course Code: 19150305	
Course Title: Data Base Management Systems	
CO-1	Define a Database Management System
CO-2	Give a description of the Database Management structure Understand the applications of Databases
CO-3	Know the advantages and disadvantages of the different models
CO-4	Compare relational model with the Structured Query Language (SQL)
CO-5	Know the constraints and controversies associated with relational Database model. know the rules guiding transaction ACID
CO-6	Understand the concept of data planning and Database design Identify the various functions of Database Administrator
Course Code: 19150306	
Course Title: Design Thinking & Product Innovation	
CO-1	Create software designs that are scalable and easily maintainable
CO-2	Use structural design patterns for better class and object composition
CO-3	Ability to understand and apply common design patterns to incremental / iterative development.
CO-4	Ability to identify appropriate patterns for design of given problem.
Course Code: 19153311	
Course Title: Basic Engineering Workshop	
CO-1	Assemble and disassemble components of a PC
CO-2	Construct a fully functional virtual machine, Summarize various Linux operating system commands,
CO-3	Recognize characters & extract text from scanned images, Create audio files and podcasts
CO-4	Assemble and disassemble components of a PC
Course Code: 19150312	
Course Title: Object Oriented Programming Through C++ Laboratory	
CO-1	Describe OOPs concepts.
CO-2	Understand and describe and use constructors and destructors
CO-3	Create and analyze algorithms for solving simple problems.
Course Code: 19150313	
Course Title: Data Structures Laboratory	
CO-1	Ability to understand a systematic approach to organizing, writing and debugging C programs
CO-2	Create and analyze algorithms for solving simple problems.
CO-3	Ability to choose appropriate data structures to represent data items in real world.
Course Code: 19150314	
Course Title: Data Base Management Systems Laboratory	
CO-1	Students get practical knowledge on designing and creating relational database systems.
CO-2	Understand various advanced queries execution such as relational constraints, joins, set. operations, aggregate functions, trigger, views and embedded SQL
CO-3	Apply the normalization techniques for development of application

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Course Outcomes for Second Year Fourth Semester	
Course Code: 19150401	
Course Title: Java Programming	
CO-1	Learn the structure of Java Program and its applications
CO-2	Develop a software/application using Java Programming language
CO-3	Synthesize the give problem and implement it in Java
CO-4	Choose an engineering approach to solve problems using Java
Course Code: 19150402	
Course Title: Operating Systems	
CO-1	Describe the general architecture of computers and types of Operating Systems
CO-2	Understand the various concepts of process and File System
CO-3	Implement concurrency mechanisms and Paging Technique
CO-4	Implement Bankers Algorithms to handle deadlocks and scheduling
CO-5	Design and analyze mechanisms used in memory management
Course Code: 19150403	
Course Title: Formal Languages and Automata Theory	
CO-1	Appreciate the role and structure of Language theory.
CO-2	Design of regular expressions for language constructs and conversions of NFA and DFA.
CO-3	Demonstrate the derivations and properties of various CFG and Regular Grammars.
CO-4	Understand the Minimization of CFG's.
CO-5	Appreciate the role of the Turing machine as computational and universal machine
Course Code: 19150404	
Course Title: Number Theory & Applications	
CO-1	Understand the importance of number theory in computer science
CO-2	Apply the congruency modulo relations to the cryptography
CO-3	Solve all arithmetic functions and their applications
Course Code: 19150405	
Course Title: Design and Analysis of Algorithms	
CO-1	Analyze best and worst-case running times of algorithms
CO-2	Describe various algorithm design situation
CO-3	Design engineering problems
Course Code: 1915046a	
Course Title: Open Elective-IV (Financial Management for Engineers)	
CO-1	Understand the basic concepts of Management.
CO-2	Describe the planning process to make decisions.
CO-3	Distinguish between different organizational structures.
Course Code: 1915046a	
Course Title: Open Elective-IV (Entrepreneurship qualities for Engineers)	
CO-1	Pick up about Foundation of Entrepreneurship Development and its theories
CO-2	Demonstrate an ability to engage in critical thinking by analyzing situations and constructing and selecting viable solutions to solve problems.
CO-3	Analyze the various aspects, scope and challenges under an entrepreneurial venture.
Course Code: 1915046a	
Course Title: Open Elective-IV (Managerial Economics & Financial Analysis)	
CO-1	Estimate the Demand and demand elasticities for a product
CO-2	Understand the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
CO-3	Understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
Course Code: 1915046a	
Course Title: Open Elective-IV (Principles of Management)	
CO-1	Understand the concepts related to management and different schools of management thoughts.
CO-2	Apply the concepts of planning for effective management.
CO-3	Identify common organizational structures and the advantages and disadvantages
Course Code: 1915046a	
Course Title: Open Elective-IV (Organizational Behavior)	
CO-1	Understand the basic concepts of Management.
CO-2	Describe the planning process to make decisions

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CO-3	Know the group dynamic and different leadership style
Course Code: 1915046a	
Course Title: Open Elective-IV (Digital Marketing)	
CO-1	Gain Knowledge of overall understanding of digital marketing
CO-2	Develop insight on current trends – digital and social statistics (Infographics)
CO-3	Provide an introduction to digital marketing platforms like.. Facebook, Twitter, YouTube, Pinterest, etc.
Course Code: 1915046a	
Course Title: Open Elective-IV (Operations Management)	
CO-1	Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness.
CO-2	Analyze and evaluate various facility alternatives and their capacity decisions, develop a balanced line of production & scheduling and sequencing techniques in operation environments.
CO-3	Develop aggregate capacity plans and MPS in operation environment.
Course Code: 19150411	
Course Title: Operating Systems Laboratory	
CO-1	Implement various CPU scheduling, page replacement and disk scheduling algorithms.
CO-2	Implement various system calls.
CO-3	Implement Bankers algorithm for Dead Lock Avoidance and Prevention
CO-4	Implement the file allocation strategies
Course Code: 19150412	
Course Title: Java Programming Laboratory	
CO-1	Write programs for solving real world problems using java collection frame
CO-2	Write programs using abstract classes
CO-3	Write multithreaded programs
CO-4	Write GUI programs using event handling in Java
CO-5	Write programs using applet.
Course Outcomes for Third Year Fifth Semester	
Course Code: 19150501	
Course Title: Compiler Design	
CO-1	Realize basics of compiler design and apply for real time applications
CO-2	Explore different translation languages
CO-3	Know about compiler generation tools and techniques
CO-4	Design a compiler for a simple programming language
Course Code: 19150502	
Course Title: WEB TECHNOLOGIES	
CO-1	Analyze a web page and identify its elements and attributes.
CO-2	Create web pages using XHTML and Cascading Styles sheets.
CO-3	Build dynamic web pages
CO-4	Build web applications using PHP
CO-5	Write simple client-side scripts using AJAX Programming through PERL.
Course Code: 19150503	
Course Title: SOFTWARE ENGINEERING	
CO-1	Identify, formulate, and solve complex engineering problems by applying principles of software engineering
CO-2	Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare.
CO-3	Acquire and apply new knowledge as needed, using appropriate learning strategies.
CO-4	Function effectively on a team whose members together provide leadership, objectives.
Course Code: 19150504	
Course Title: COMPUTER NETWORKS	
CO-1	Independently understand basic computer network technology.
CO-2	Identify the different types of network topologies and protocols.
CO-3	Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
Course Code: 19150505A	
Course Title: Advanced JAVA Programming	
CO-1	Create a full set of UI widgets and other components, including windows, menus, buttons, checkboxes, text fields, scrollbars and scrolling lists, using AWT-Swing.

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CO-2	Learn to access database through Java programs, using Java Data Base Connectivity (JDBC)
CO-3	Create dynamic web pages, using Servlets and JSP.
CO-4	Implement a reusable software component, using Java Bean.
Course Code: 19150505B	
Course Title: Principles of Computer Security	
CO-1	Evaluate vulnerability of an information system and establish a plan for risk management.
CO-2	Demonstrate basic principles of Web application security
CO-3	Evaluate the authentication and encryption needs of an information system.
CO-4	Demonstrate how to secure a network
CO-5	Evaluate vulnerability of an information system and establish a plan for risk management.
Course Code: 19150505C	
Course Title: Principles of Computer Security	
CO-1	Think and develop new mobile application.
CO-2	Take any new technical issue related to this new paradigm and come up with a solution(s).
CO-3	Develop new ad hoc network applications and/or algorithms/protocols.
CO-4	Understand & develop any existing or new protocol related to mobile environment
CO-5	Think and develop new mobile application.
Course Code: 19150511	
Course Title: Compiler Design & Computer Networks Laboratory	
CO-1	Gain knowledge base in compiler design and its applications.
CO-2	Identify the different types of network topologies and protocols.
CO-3	Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer
Course Code: 19150512	
Course Title: Web Technologies Laboratory	
CO-1	Analyze a web page and identify its elements and attributes.
CO-2	Create web pages using XHTML and Cascading Style Sheets.
CO-3	Build dynamic web pages using JavaScript (Client-side programming).
CO-4	Create XML documents and Schemas
Course Code: 19150581	
Course Title: Community Service Oriented Project	
Course Code: 19150522	
Course Title: Mini Project-1/ Study Project/ Internship	
Course Outcomes for Third Year Sixth Semester	
Course Code: 19150601	
Course Title: DATA MINING	
CO-1	Understand the need of data mining and the way it is different from traditional statistical techniques.
CO-2	Understand the need and importance of pre-processing techniques
CO-3	Understand and implement classical algorithms in data mining; students will be able to assess the strengths and weaknesses of the algorithms, identify the application area of algorithms, and apply them.
CO-4	Analyze and evaluate performance of algorithms for Association Rules.
CO-5	Analyze Classification and Clustering algorithms
Course Code: 19150602	
Course Title: Artificial Intelligence	
CO-1	Build intelligent agents for search and games
CO-2	Solve AI problems through programming with Python
CO-3	Learning optimization and inference algorithms for model learning
CO-4	Design and develop programs for an agent to learn and act in a structured environment.
Course Code: 19150603	
Course Title: Unified Modeling Language	
CO-1	Identify the purpose and methods of use of common object-oriented design patterns.
CO-2	Select and apply these patterns in their own designs for simple programs
CO-3	Represent the data dependencies of a simple program using UML.

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Course Code: 19150664A	
Course Title: PROFESSIONAL ELECTIVE-II (Software Architecture, Frameworks and Patterns)	
CO-1	Understand the Patterns, Design Patterns, Frameworks, Software and To Application Architecture, Types of Architecture.
CO-2	Monolithic, Need of Micro services Architecture, MS implementation, MS tools and technologies.
CO-3	Understand the Core Java Design patterns, GOF, JEE Blue Print patterns and principles.
CO-4	Understand what is an API, APIs classification and types, Technology specific APIs, API Tools.
CO-5	Understand the Patterns, Design Patterns, Frameworks, Software and To Application Architecture, Types of Architecture.
Course Code: 19150664B	
Course Title: PROFESSIONAL ELECTIVE-II (Virtual Reality)	
CO-1	Understanding of techniques, processes, technologies and equipment used in immersive virtual reality
CO-2	Identify critical awareness of historical and theoretical contexts relevant to immersive virtual reality
CO-3	Identify and Analyze visualization of image having big data.
Course Code: 19150664C	
Course Title: PROFESSIONAL ELECTIVE-II (Distributed Systems)	
CO-1	Discuss trends in Distributed Systems.
CO-2	Apply network virtualization.
CO-3	Apply remote method invocation and objects.
CO-4	Design process and resource management systems.
CO-5	Discuss trends in Distributed Systems.
Course Code: 19150665a	
Course Title: OPEN ELECTIVE-II (Solid Waste Management)	
CO-1	Understand the Objects of Solid waste management
CO-2	Understand the elements of Solid waste management
CO-3	Design the Transportation facility in Solid waste management
CO-4	Characterize the solid waste and design a composting facility
CO-5	Know the criteria for selection of landfill
Course Code: 19150665a	
Course Title: OPEN ELECTIVE-II (Energy Management)	
CO-1	To acquire knowledge on Basic functional elements of instrumentation
CO-2	Ability to compare between various measurement techniques
CO-3	To acquire knowledge on Various storage and display devices
CO-4	To understand the concepts Various transducers and the data acquisition systems
CO-5	Ability to model and analyze electrical and electronic Instruments and understand the operational features of display Devices and Data Acquisition System
Course Code: 19150665a	
Course Title: OPEN ELECTIVE-II (MEMS)	
CO-1	Discuss the principles and various steps of different micro machining and fabrication techniques.
CO-2	Explain the working principle and fabrication methods of Micro mechanical sensors and actuators.
CO-3	Describe the working principles and construction of various thermal sensor and actuators.
CO-4	Discuss the working principles and fabrication techniques of Magnetic sensors and actuators, and MOEMS devices.
CO-5	Identify different micro fluid actuation techniques and explain the working and construction of BioMEMS devices.
Course Code: 19150665a	
Course Title: OPEN ELECTIVE-II (Digital Image Processing)	
CO-1	Acquire knowledge in the digital image processing for image enhancement as well as restoration of noisy images
CO-2	Understand the methods like Image restoration, morphing, segmentation and compression.
CO-3	Understand and apply various techniques to handle the image data in any field.
Course Code: 19150665a	
Course Title: OPEN ELECTIVE-II (Information Security)	
CO-1	Analyze the security principles and corresponding attacks.

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CO-2	Apply different encryption algorithms to message security
CO-3	Evaluate and Analyze Hashing Algorithms
CO-4	Study the IP and Transport layer security.
CO-5	Analyze the security principles and corresponding attacks.
Course Code: 19150665a	
Course Title: OPEN ELECTIVE-II (Disaster Management in Mining)	
CO-1	To outline the different safety concepts and Job Safety analysis.
CO-2	To outline and explain the Human and vehicle characteristics and protective devices.
CO-3	To identify and suggest suitable mitigation measures in construction industry.
CO-4	Investigate the Railway risk and safety operations
CO-5	To explain the operation of various types of Irrigation System Accidents
Course Code: 19150665a	
Course Title: OPEN ELECTIVE-II (Hybrid and Electric Vehicles)	
CO-1	Understand the architecture and vehicle dynamics of electric and hybrid vehicles
CO-2	Analyze and model the power management systems for electric and hybrid vehicles
CO-3	Devise power electronics-based control strategies for electric and hybrid vehicles
CO-4	Analyze and design various components of electric and hybrid vehicles with environment concern.
CO-5	Investigate and model the issues in mathematical domain related to grid interconnections of electric and hybrid vehicle.
Course Code: 19150606	
Course Title: CONSTITUTION OF INDIA	
CO-1	Understand historical background of the constitution making and its importance for building a democratic India.
CO-2	Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
CO-3	Understand the value of the fundamental rights and duties for becoming good citizen of India.
CO-4	Analyze the decentralization of power between central, state and local self-government.
CO-5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
Course Code: 19150612	
Course Title: AI TOOLS & TECHNIQUES LABORATORY	
CO-1	Build intelligent agents for search and games
CO-2	Solve AI problems through programming with Python
CO-3	Learning optimization and inference algorithms for model learning
CO-4	Design and develop programs for an agent to learn and act in a structured environment.
Course Code: 19150613	
Course Title: UNIFIED MODELING LANGUAGE LABORATORY	
CO-1	Show the importance of systems analysis and design in solving complex problems
CO-2	Show how the object-oriented approach differs from the traditional approach to systems analysis and design
CO-3	Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation.
CO-4	Recognize the difference between various object relationships: inheritance, association, whole-part, and dependency relationships
Course Code: 19150611	
Course Title: Soft Skills	
CO-1	Be effective communicators and participate in group discussions with confidence. Also be able to make presentations in a professional context.
CO-2	Write resumes, prepare and face interviews confidently.
CO-3	Be assertive and set short term and long-term goals. Also learn to manage time effectively and deal with stress.

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CO-4	Make the transition smoothly from campus to corporate.
CO-5	Be effective communicators and participate in group discussions with confidence. Also be able to make presentations in a professional context.
Course Outcomes for Fourth Year Seventh Semester	
Course Code: 19150701	
Course Title: Cryptography and Network Security	
CO-1	Analyze the security principles and corresponding attacks.
CO-2	Apply different encryption algorithms to message security
CO-3	Evaluate and Analyze Hashing Algorithms
CO-4	Study the IP and Transport layer security.
CO-5	Analyze the security principles and corresponding attacks.
Course Code: 19150702	
Course Title: Machine Learning	
CO-1	Gain knowledge about basic concepts of Machine Learning
CO-2	Identify machine learning techniques suitable for a given problem
CO-3	Solve the problems using various machine learning techniques
CO-4	Apply Artificial Neural Networks and Dimensionality reduction techniques.
CO-5	Design application using machine learning techniques.
Course Code: 19150763A (Professional Elective-III)	
Course Title: NoSQL Databases	
CO-1	Design and effectively put MongoDB in use for application that demands large volume of data set.
CO-2	Able to write complex map-reduce functions to aggregate data from multiple notes and derive meaning details out of it.
CO-3	Able to visualize the deployment model, associated security, application architecture.
Course Code: 19150763B (Professional Elective-III)	
Course Title: Digital Image Processing	
CO-1	Acquire knowledge in the digital image processing for image enhancement as well as restoration of noisy images
CO-2	Understand the methods like Image restoration, morphing, segmentation and compression.
CO-3	Understand and apply various techniques to handle the image data in any field.
Course Code: 19150763C (Professional Elective-III)	
Course Title: Cloud Computing	
CO-1	Understanding the key dimensions of the challenge of Cloud Computing
CO-2	Assessment of the economics, financial, and technological implications for selecting cloud computing for own organization
CO-3	Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
CO-4	Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas
CO-5	Understanding the key dimensions of the challenge of Cloud Computing
Course Code: 19150764A (Professional Elective-IV)	
Course Title: Big Data Analytics	
CO-1	Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
CO-2	Acquire fundamental enabling techniques and scalable algorithms like Hadoop in Bigdata Analytics.
CO-3	Understand the need and application of Map Reduce
CO-4	Understand Hive to explore and analyze huge datasets.
CO-5	Understand Spark Framework and execution Model.
Course Code: 19150764B (Professional Elective-IV)	
Course Title: Deep Learning	
CO-1	Understand the concepts of Tensor Flow, its main functions, operations and the execution pipeline
CO-2	Implement deep learning algorithms, understand neural networks and traverse the layers of data abstraction which will empower the student to understand data more precisely.
CO-3	Learn topics such as convolution neural networks, recurrent neural networks, training deep networks and high-level interfaces
CO-4	Build deep learning models in Tensor Flow and interpret the results

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CO-5	Understand the language and fundamental concepts of artificial neural networks.
Course Code: 19150764C (Professional Elective-IV)	
Course Title: Parallel Computing	
CO-1	Understand different parallel architectures and models of computation.
CO-2	Learn parallel algorithms development techniques for shared memory and message passing models.
CO-3	To introduce the various classes of parallel algorithms.
CO-4	Study parallel algorithms for basic problems.
CO-5	Study the complexity and correctness models for parallel algorithms.
Course Code: 19119765a (Open Elective-IV)	
Course Title: Global Environment Problems & Policies	
CO-1	To Understand core concepts and methods from ecological and physical sciences and their application in environmental problem-solving.
CO-2	To Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
CO-3	To Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
CO-4	To know environmental laws and grasp the concept of environmental legislation and its application in international environmental agreement.
CO-5	To appreciate the concern of environmental agreement.
Course Code: 19129765a (Open Elective-IV)	
Course Title: Renewable Energy Resources	
CO-1	Analyze solar radiation data, extraterrestrial radiation, radiation on earth's surface.
CO-2	Design solar thermal collections.
CO-3	Develop maximum power point techniques in solar PV and wind
CO-4	Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations
Course Code: 19139765a (Open Elective-IV)	
Course Title: Nano Technology	
CO-1	Describe the classification and applications of nano materials in engineering and other fields.
CO-2	Discuss the mechanical, electrical, thermal and physical properties of nano materials.
CO-3	Explain the synthesis, fabrication and requirements of nano particles.
CO-4	Describe the uses of characterization techniques such as spectroscopy, SEM, TEM and XRD.
CO-5	Discuss the application of carbon nano technology.
Course Code: 19149765a (Open Elective-IV)	
Course Title: Data Communication	
CO-1	Understand the importance of data communication, the Layered architecture of Open System Interconnection (OSI) and Transmission Control Protocol / Internet Protocol (TCP/IP) models.
CO-2	Understand conversion of signals from Digital to Digital, Analog to Digital & Digital to Analog conversion, bandwidth utilization techniques
CO-3	Understand Error detection and correction techniques, Flow control & error control and DLC services.
CO-4	Understand operations of Channelization protocols, Random Access protocols and Wired & Wireless LAN.
CO-5	Understand the working of 802.11, Cellular Telephony, Bluetooth, IPv4 and IPv6 Addresses.
Course Code: 19159765a (Open Elective-IV)	
Course Title: Human Computer Interaction	
CO-1	Explain the capabilities of both humans and computers from the viewpoint of human information processing.
CO-2	Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.
CO-3	Apply an interactive design process and universal design principles to designing HCI systems

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Course Code: 19169765a (Open Elective-IV)	
Course Title: Remote Sensing & GIS in Mining	
CO-1	Outline the basic principles of Remote Sensing.
CO-2	Develop the concepts of visual and digital image analysis.
CO-3	Summarize the basic concepts of GIS.
CO-4	Perform spatial analysis.
CO-5	Apply knowledge of remote sensing and GIS in various fields
Course Code: 19179765a (Open Elective-IV)	
Course Title: Modern Vehicle Technology	
CO-1	Design and develop modern vehicles
CO-2	Analyze and control the exhaust emissions and noise
CO-3	Analyze the vehicle operation and incorporate and develop the electronic control systems
CO-4	Distinguish and choose the fuel injection system
CO-5	Classify the design analysis of injection systems
Course Code: 19199781	
Course Title: Intellectual Property Rights and Patents	
CO-1	Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents
CO-2	Student get an insight on Copyrights, Patents and Software patents which are instrumental for further advancements
CO-3	Enhance technical skills to get patents and understand copyright laws.
CO-4	Analyze the Laws relating to the Trade Marks.
CO-5	Explore the Trade Secrets & Cyber Law and Cyber Crime.
Course Code: 19150711	
Course Title: Cryptography and Network Security Laboratory	
CO-1	Analyze the security principles and corresponding attacks.
CO-2	Apply different encryption algorithms to message security
CO-3	Evaluate and Analyze Hashing Algorithms
CO-4	Study the IP and Transport layer security
Course Code: 19150712	
Course Title: Machine Learning Laboratory	
CO-1	understand complexity of Machine Learning algorithms and their limitations;
CO-2	understand modern notions in data analysis-oriented computing;
CO-3	be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
CO-4	Be capable of performing experiments in Machine Learning using real-world data
Course Code: 19150731	
Course Title: Mini Project-2/ Internship	
CO-1	To create an Industrial environment and culture within the institution.
CO-2	To standardize laboratories to industrial standard, thereby giving exposure to industrial housekeeping standards.
CO-3	To set up production lab utilizing the infrastructure of the institution.
CO-4	To give oral presentation related to the work completed
CO-5	To promote the concept of entrepreneurship.
Course Outcomes for Fourth Year Eighth Semester	
Course Code: 19150801	
Course Title: Software Testing Methodologies	
CO-1	Apply software testing knowledge and engineering methods.
CO-2	Design and conduct a software test process for a software testing project.
CO-3	Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.
CO-4	Identify the needs of software test automation, and define and develop a test tool to support test automation.
CO-5	Apply software testing knowledge and engineering methods.

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Course Code: 19150862A (Professional Elective-V)	
Course Title: Distributed Databases	
CO-1	Advanced concepts of Database SQL, PLSQL
CO-2	Distributed Database and Types.
CO-3	Database Security
CO-4	Database Warehouse and ETL
CO-5	Advanced concepts of Database SQL, PLSQL
Course Code: 19150862B (Professional Elective-V)	
Course Title: Cyber Security	
CO-1	Analyze threats and risks within context of the cyber security architecture
CO-2	Appraise cyber security incidents to apply appropriate response
CO-3	Evaluate decision making outcomes of cyber security scenarios
Course Code: 19150862C (Professional Elective-V)	
Course Title: Soft Computing	
CO-1	Describe human intelligence of soft computing and explain how intelligent system works
CO-2	Apply basics of Fuzzy logic and neural networks.
CO-3	Discuss the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
CO-4	Relate with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems
CO-5	
Course Code: 19150841	
Course Title: Project	
CO-1	Understanding how to work in actual industry environment
CO-2	Utilize the technical resources
CO-3	Write technical/training reports
CO-4	To give oral presentation related to the work completed
CO-5	To provide students hands on experience on, troubleshooting, maintenance, fabrication, innovation, record keeping, documentation etc. thereby enhancing the skill and competency part of technical education

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GR-19 B.Tech Automobile Engineering

VISION of Automobile Engineering

To make a preferred destination to the students to become competent automobile engineer to meet the global demands with moral & ethical values and entrepreneurial skills, making the campus vibrant to derive utmost pleasure to both the staff & students, and to be recognised as a pioneer research centre to serve the society through application of scientific and engineering methods, innovative ideas, and discoveries.

MISSION of Automobile Engineering

The department is committed to impart best knowledge through

- teaching regular practices and updating new technologies through utilization of software tools, sophisticated teaching aids

-guest lectures, workshops, seminars and conferences

- bridging the gap between industry and college through frequent industrial visits

- carrying out world class research projects

-inculcating moral & ethical values and encouraging the student towards social work

- developing entrepreneurial skills

PROGRAMME EDUCATIONAL OBJECTIVES of Automobile Engineering

Within a few years after completion of the program the graduate will be;

PEO1: Sound knowledge in mathematical, scientific and engineering fundamentals to meet the professional demands of the automobile industries in India and around the world

PEO2: Synthesize the data, technical concepts and software tools, for application to automotive design and investigation.

PEO3: Design, plan and execute entrepreneurial projects related to automobile industries in orderly manner and can meet financial constraints.

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PROGRAMME OUTCOMES of Automobile Engineering

At the end of the program the student is able to;

1. Apply the knowledge in mathematics, science and engineering for practical problems with ease.

2. Design and conduct experiments, interpret data, analyze it and report results.

3. Design an Automobile or relevant system that meets the comfort and safety of the user or worker with global standards.

4. Investigate and unearth the causes of failure of automobile components, industrial accidents, road mishaps or crimes.

5. Familiar with modern engineering tools, equipment and software tools to analyze the problems.

6. Confident to apply engineering solutions in global and societal context.

7. Find the causes of environment pollution and solutions for sustainability.

8. Understand the professional and ethical values and act accordingly.

9. Transform the innovative ideas individually as well as with engineering & science laboratory teams and multidisciplinary teams.

10. Communicate effectively in verbally, graphically and written forms to increase coordination and cooperation in the team.

11. Design, plan and execute projects in orderly manner and meet the financial and other constraints.

12. Understand the impact of modern technology on society by the awareness of the contemporary issues and act appropriately throughout life.

PROGRAMME SPECIFIC OUTCOMES of Automobile Engineering

PSO 1: Ability to apply various engineering principles and CAD/CAM software to design, manufacture and analyze automobile systems, subsystems and components.

PSO 2: Ability to establish startups in automobile field to manufacture subsystems or vehicle maintenance.

PSO 3: Ability to operate, maintain, trouble shoot and rectify various types of automobiles.

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Course Outcomes of All Semester Courses	
Course Code: 19198101	
Course Title: MATHEMATICS-I	
CO1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
CO2	Utilize mean value theorems to real life problems
CO3	Familiarize with functions of several variables which is useful in optimization
CO4	Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional coordinate systems.
CO5	Students will become familiar with 3-dimensional coordinate systems and also learn the utilizations of special functions.
Course Code: 19198102	
Course Title: COMMUNICATIVE ENGLISH-I	
CO-1	To apply their learning in different fields and can serve the society accordingly
CO-2	Identify safety measures against different kinds of accidents at home and also in the workplace.
CO-3	Experiment the usefulness of animals for the human society
CO-4	Appraise writing skills that is required for professional development
Course Code:	
Course Title: Engineering Graphics	
CO-1	Apply principles of drawing to represent dimensions of an object
CO-2	Outline the polygons and engineering curves.
CO-3	Illustrate projections of points, lines, planes and solids.
CO-4	Illustrate the 3D views through isometric views.
CO-5	Create the isometric views and orthographic views
Course Code: 19198103	
Course Title: Engineering Chemistry	
CO-1	Distinguish between temporary and permanent hardness of water

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CO-2	Illustrate the principles and applications of solar
CO-3	Identify different organic coatings
CO-4	Analyse the importance of nano and smart materials.
CO-5	Distinguish the principles of BET and TEM.
Course Code: 19192105	
Course Title: Basic electric and electronics engineering	
CO-1	Analyse the various electrical networks
CO-2	Understand the operation of DC machines, 3-point starter and conduct the
CO-3	Analyse the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
CO-4	Analyse the operation of half Wave, full wave rectifiers, op-amps.
CO-5	Explain the single stage CE amplifier and concept of feedback amplifier
Course Code: 19198194	
Course Title: Professional ethics & human values	
CO-1	Create awareness on professional ethics and Human values.
CO-2	Create awareness on engineering ethics providing basic knowledge about engineering ethics, Variety of moral dilemmas Professional ideas and virtues
CO-3	Provide basic familiarity about engineers as responsible experimenters, Research
CO-4	Inculcate knowledge and exposure on safety and risk benefit analysis and have an idea about collective bargaining, confidentiality, professional, employee,
CO-5	Have an adequate knowledge about MNC's Business environment, computer ethics
Course Code: 19198112	
Course Title: Engineering Chemistry Laboratory	
CO-1	Estimate the metal content in different ores (Fe, Cr & Cu). (L-3)
CO-2	Compare viscosities of different oils. (1-2)
CO-3	Analyse the quality of ground water sample. (L-4)
Course Code: 19198111	
Course Title: Communicative English Laboratory	
CO-1	Appraise the importance of functional English

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CO-2	Relate the knowledge to the competitive world.
CO-3	Identify the necessity to follow native speakers' accent
CO-4	Experiment how the communicative items in the laboratory will help the students to be effective communicators
Course Code: 19198113	
Course Title: Basic Electrical & Electronics Engineering Lab	
CO-1	Determine performance of electrical machines
CO-2	Determine characteristics of electronic devices
CO-3	Control speed of DC motor
CO-4	Measure current, voltage and power in a circuit.
CO-5	Determine current and voltage using Kirchhoff's laws.
Course Code: 19198201	
Course Title: MATHEMATICS–II	
CO-1	Solve first order differential equations related to various engineering fields
CO-2	Identify solution methods for partial differential equations that model
CO-3	Interpret the physical meaning of different operators such as gradient, curl and divergence
CO-4	Estimate the work done against a field, circulation and flux using vector calculus.
Course Code: 1918205	
Course Title: Engineering Physics & its applications	
CO-1	To introduce basic concepts of Mechanics and apply for solving advanced engineering problems related to Earth's rotation in designing and launching missiles.
CO-2	To introduce basic and advanced concepts of acoustics and ultrasonics and apply the principles of acoustics for noise cancellation and for medical applications
CO-3	To analyse the elastic behaviour of different materials and to identify the fracture/ yielding of materials along with the relationship between elastic constants loads
CO-4	To introduce basic concepts of heat transfer and thermodynamics and to classify the different modes of transfer of heat energy to evaluate the thermal conductivity of different
CO-5	To introduce basic concepts and working of different sensors and to identify the sensors for various engineering applications.
Course Code: 19195206	
Course Title: Problem Solving & Programming in C	
CO-1	Obtain knowledge about different languages used in computer programming and basic terminology used in computer programming.

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CO-2	Write algorithm, flow chart, and structure of C program and make use of different C tokens
CO-3	Develop program by using Control structure, different looping and Jump statement.
CO-4	Implement applications of Array, Structure and String inside the program. Also acquire the knowledge of different FILE operations.
CO-5	Obtain knowledge about accessing the memory in the program and also to develop the program by using different types of function calls.
Course Code: 19198202	
Course Title: Communicative English-II	
CO-1	At the end of the course, the learners will be able to
CO-2	Prioritize information from reading texts after selecting relevant and useful points
CO-3	Paraphrase short academic texts using suitable strategies and conventions
CO-4	Make formal structured presentations on academic topics using PPT slides with relevant Graphical elements
Course Code: 19198293	
Course Title: Environmental Studies	
CO-1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO-2	Comprehend environmental problems from multiple perspectives with emphasis on human modem lifestyles and developmental activities
CO-3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO-4	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO-5	Influence their society in proper utilization of goods and services.
CO-6	Learn the management of environmental hazards and to mitigate disasters and have a clear understanding of environmental concerns and follow sustainable development practices.

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Course Title: Engineering Mechanics	
CO-1	Understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body. Describe the concept of friction and analyse the equilibrium of rigid bodies subjected to force.
CO-2	Analyse planar and spatial systems to determine the forces in members, to understand the concepts of Equilibrium of Systems of Forces, law of Triangle of forces and converse of the law of polygon of forces
CO-3	Discuss the concepts of "centre of gravity" and "centroids" and compute their location for bodies of arbitrary shape, to understand the concepts of Area moments of Inertia, Mass Moment of Inertia.
CO-4	Illustrate the laws of motion, kinematics of motion and their inter relationship.
CO-5	Able to determine basic dynamics concepts - the Work-Energy principle, Impulse- Momentum principle and to understand the concepts of Equations for Translation, D'Alembert's principle in rotation.
Course Code: 19198205	
Course Title: ENGINEERING PHYSICS LABORATORY	
CO-1	To handle optical instruments like microscope and spectrometer, determine thickness of a hair/paper with the concept of interference and to estimate the wavelength and resolving power of different colours using diffraction grating
CO-2	To demonstrate the importance of dielectric material in storage of electric field energy in the capacitors and plot the intensity of the magnetic field of circular coil carrying current with varying distance
CO-3	To evaluate the acceleration due to gravity using compound pendulum
CO-4	To determine the moment of inertia using Fly wheel
Course Code: 19198211	
Course Title: COMMUNICATIVE ENGLISH LABORATORY II	
CO-1	Paraphrase short academic texts using suitable strategies and conventions.
CO-2	Make formal structured presentations on academic topics using PPT slides with relevant
CO-3	Graphical elements

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CO-4	Participate in group discussions using appropriate conventions and language strategies
CO-5	Prepare a CV with a cover letter to seek internship/job
CO-6	Collaborate with a partner to make presentations and Project Reports

COURSE CODE: 19179301	
COURSE TITLE: MATHEMATICS-III	
CO-1	Differentiation and Integration of Complex Functions used in engineering problems
CO-2	Apply the Laplace transform for solving differential equations (continuous systems
CO-3	Find the Fourier series of periodic signals
CO-4	Know and be able apply integral expressions for the forwards and inverse Fourier transform to a range bof non-periodic waveforms
CO-5	Find the general solutions of the PDEs bearing applications
COURSE CODE: 19170302	
COURSE TITLE: Basic Automobile Engineering	
CO-1	Compare different types of automobiles and their components
CO-2	Differentiate working principles of different types of automobile engines
CO-3	Illustrate working of different transmission elements and control systems
CO-4	Implement different types of safety systems.
CO-5	Implement effective pollution reduction methods
COURSE CODE: 19170303	
COURSE TITLE: Metallurgy and Materials Science	
CO-1	Demonstrate the knowledge of science and fundamentals of materials
CO-2	Describe the regions of stability of phases that occur in the alloy systems.

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CO-3	Able to classify steels and cast Irons with applications.
CO-4	Able to select heat treatment methods and non-ferrous materials
CO-5	Explain the concept of ceramics and composites
COURSE CODE: 19170304	
COURSE TITLE: Mechanics of Solids	
CO-1	Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials
CO-2	Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings
CO-3	Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural.
CO-4	Calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels
CO-5	Able to calculate the failure load of column and struts with different type of end condition.
COURSE CODE: 19170305	
COURSE TITLE: Fluid Mechanics and Hydraulic Machinery	
CO-1	Describe the properties of fluids and explain the mechanics of fluids at rest and in motion by observing the fluid phenomena
CO-2	Distinguish the types of flows and continuity equation
CO-3	Deserve Euler's Equations of motion and Deduce Bernoulli's equation
CO-4	Examine energy losses in pipe transitions and sketch energy gradient lines.
CO-5	Describe Basic working of hydraulic turbines and hydraulic pumps.
COURSE CODE: 19170386	
COURSE TITLE: Design Thinking & Product Innovation	
CO-1	Immerse into the world of innovation.
CO-2	Provide a thinking space for new alternatives products.

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CO-3	Generate low risk ideas
CO-4	Negotiate with organisation
CO-5	Deliver more valued and successful solutions
COURSE CODE: 19170377	
COURSE TITLE: Computer Aided Engineering Drawing Practice	
CO-1	Construct the diagrams in engineering
CO-2	Modify the drawing using modern engineering software tools
CO-3	Produce the drawing based on ISO and BIS Standards
CO-4	Design various components of an automobile
CO-5	Reconstruct the drawings and invent new designs of components
COURSE CODE: 19170311	
COURSE TITLE: Automobile Chassis Components Lab	
CO-1	Differentiate and contrast different types of automobiles
CO-2	Demonstrate different types of engines
CO-3	Demonstrate different components of automobile
CO-4	Analyze different power transmission elements
CO-5	Organize different vehicle control systems.
COURSE CODE: 19170312	
COURSE TITLE: Mechanics of Solids & Fluid Mechanics Lab	
CO-1	Distinguish properties of different types of materials
CO-2	Investigate different failures of machine components
CO-3	Apply different materials for different applications
CO-4	Illustrate different property measuring machines

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CO-5	Apply hydraulic principles to various systems of automobiles such as fuel, Lubricant, cooling and aerodynamic
Course Code: 19179401	
Course Title: Numerical Methods and Probability and Statistics	
CO-1	Apply the knowledge of descriptive statistics and method of data science in practical engineering problems
CO-2	Apply the knowledge of Probability in Practical Engineering problems
CO-3	Demonstrate the knowledge of Probability distributions
CO-4	Enhance the knowledge of a classical hypothesis techniques
CO-5	Enhance the knowledge in inferential methods based on small and large sampling tests
Course Code: 19170402	
Course Title: Kinematics of Machinery	
CO-1	To know about the degrees of freedom for a particular combination of linkages
CO-2	Understand the working of different mechanisms
CO-3	The kinematics of machines deals with the motion of members of the mechanisms which includes the determination of velocities and acceleration of the machine members
CO-4	Analyse the motion of the cams and followers
CO-5	Understand the motion of the component of the mechanism's automobile and gear trains
Course Code: Automotive Engines	
Course Title: 19170403	
CO-1	Analyse and conduct the experiments of the automotive SI and CI engines
CO-2	Investigate the thermochemistry of air-fuel mixtures
CO-3	Compare the properties and combustion of gasoline, diesel fuel processes
CO-4	Design and solve the problems of various operating parameters of the engine
CO-5	Analyse and plot the performance and pollution characteristics of IC engines

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Course Code: 19170404	
Course Title: Thermodynamics	
CO-1	Explain the importance of thermodynamic properties related to conversion of heat energy into work
CO-2	Apply the laws of thermodynamics to boilers, heat pumps, refrigerators, heat engines, compressors and nozzles
CO-3	Utilize steam properties to design steam-based components
CO-4	Compare thermodynamic relations and air standard cycles
CO-5	Applications of the thermodynamics in Engineering
Course Code: 19170475	
Course Title: Machine Drawing	
CO-1	Memorize the International standards
CO-2	Construct the part drawing of mechanical components
CO-3	Produce the drawings based on ISO and BIS standards
CO-4	Design and assemble various components of an automobile
CO-5	Reconstruct the drawings and invent new designs of components
Course Code:19170701	
Course Title: VEHICLE DYNAMICS	
CO-1	To make the student to analyze various kinds of vibrations
CO-2	To make the student to distinguish various kinds of vibrations caused due to different aspects like uneven road engine unbalance
CO-3	To make the student to measure the intensity of vibration
CO-4	To make the student to reduce the vibration effect on the vehicle
Course Code: 19170702	
Course Title: HYBRID, ELECTRIC & FUEL CELL VEHICLES	
CO-1	Operation of fuel cell technology
CO-2	Identification of fuel-based vehicles

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CO-3	Determination of hybrid electric technology and electronic drive trains
CO-4	Construction of hybrid electric vehicles
CO-5	Construction of hybrid electric technology
Course Code: 19170703	
Course Title: FINITE ELEMENT METHODS	
CO-1	Illustrate the concepts behind variational and weighted residual methods in FEM
CO-2	Analyze the applications and characteristics of finite element modelling
CO-3	Investigate element characteristic equation and generate global stiffness matrix
CO-4	Apply suitable boundary conditions to a global structural matrix equation and reduce it.
CO-5	Identify an appropriate FEM approach to solve problems involving dynamics and heat transfer
Course Code: 19170704	
Course Title: CAD/CAM	
CO-1	Explain the basic concepts of CAD and computer graphics
CO-2	Solve the mathematical models to represent various geometries
CO-3	Compose the part programs of engineering components
CO-4	Explain the concepts of group technology and computer aided quality control
CO-5	Discuss the elements of Flexible Manufacturing systems and computer integrated Manufacturing
Course Code: 19170765B	
Course Title: VEHICLE MAINTENANCE	
CO-1	Importance of Vehicle Maintenance
CO-2	Service Procedure of engine and subsystems
CO-3	Service procedure of drive line
CO-4	Service Procedure of Chassis components

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CO-5	Maintenance of electrical and air conditioning System
Course Code:1919766a	
Course Title: Managerial Economics and Financial Analysis	
CO-1	Analyze the scope of Managerial Economics
CO-2	Analyze various aspects of Managerial Economics, Production cost, analysis markets & pricing strategies
CO-3	Develop an ability to identify, formulate and solve engineering problems by applying the subject knowledge of managerial economics
CO-4	Apply capital budgeting, financial analysis techniques in evaluating in various investment opportunities
CO-5	Enhance their capabilities in the interpretation of balance sheets are followed in industries, organizations
Course Code:19170787	
Course Title: INTELLECTUAL PROPERTY RIGHTS AND PATENTS	
CO-1	To understand the concepts of Intellectual property rights
CO-2	Develops procedural knowledge to legal system and solving the problem relating to Intellectual property rights
CO-3	Skill to pursue the professional programs in company, laws, Business, International Affairs and other fields
CO-4	Employability as the Compliance officer and Liaison officer
CO-5	Establishment of Legal Consultancy and service provider cyber crime
Course Code:19170711	
Course Title: SERVICING, MAINTENANCE & SCANNING OF AUTOMOBILES LAB	
CO-1	Assemble and dis-assemble the various components of an automobile
CO-2	Troubleshoot the vehicle to identify the problem location
CO-3	Test and overhaul the components of a vehicle
CO-4	Calibrate measuring instruments
Course Code:19170712	

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Course Title: CAD/CAM Lab	
CO-1	Analyze various types of 2D and 3D trusses by static and dynamic analysis using ANSYS.
CO-2	Solve the static problems involving corner bracket and cylinder components.
CO-3	Examine the beams with various and conditions subjected to static load.
CO-4	Analyze various thermal properties of bodies with different geometries.
CO-5	Compose NC code for turning and pocket milling operations.
Course Code:19170861a	
Course Title: RAPID PROTOTYPING	
CO-1	Describe rapid prototyping and tooling systems.
CO-2	Recommend the part orientation and slicing methods for rapid prototyping of given part.
CO-3	Identify process parameters of liquid based rapid prototyping to improve the quality.
CO-4	Illustrate powder and solid based rapid prototyping processes.
CO-5	Identify process parameters for powder and solid based rapid prototyping.
Course Code:19170861b	
Course Title: VEHICLE PERFORMANCE & TESTING	
CO-1	Investigate the vehicle performance
CO-2	Determine the vehicle testing
CO-3	Detect the transmission performance
CO-4	Operate the control systems
CO-5	Determine the testing of vehicles on road and truck.
Course Code:19170861d	
Course Title: PRINCIPLES OF ENTREPRENEURSHIP	
CO-1	Demonstrate entrepreneurship
CO-2	Classify the product planning and development process
CO-3	Identify the public issues and bonus issues

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CO-4	Discover about production and marketing management methods
CO-5	Distinguish about motivation and leading teams

Course Code:19170861e
Course Title: ALTERNATIVE ENERGY SOURCES FOR AUTOMOBILES

CO-1	Classify the types of alternate fuels
CO-2	Determine the performance of vegetable oils in IC Engines
CO-3	Operate hydrogen in IC Engines
CO-4	Differentiate about Biogas, Natural gas and LPG
CO-5	Construct about different types of electric vehicles

Course Code:19170862e
Course Title: MODERN VEHICLE TECHNOLOGY

CO-1	Design and develop modern vehicles
CO-2	Identify the suspension systems in automobile vehicles
CO-3	Analyze braking operation in automobile vehicle
CO-4	Analyze and control the exhaust emissions and noise
CO-5	Distinguish and choose the fuel injection system

Course Code:19170841
Course Title: PROJECT WORK

CO-1	Analyze the technical procedure of planning
CO-2	Analyze the technical procedure scheduling
CO-3	Realizing an engineering product
CO-4	Acquire the skills of technical report writing and data collection.
CO-5	Examine the result analysis.

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GR-19 B.Tech Mining Engineering

B. TECH – MINING ENGINEERING

Department Vision: To be recognized as a National Centre of Excellence in Mining Engineering to cope with the challenges of sustainable development in Mining industry.

Department Mission:

1. To provide high quality Programmes supported by up-to- date curriculum and practical courses.
2. We prepare students to understand eco-friendly and sustainable development in mining industry.
3. Extensive practical courses to foster learning by observation.
4. Exposing students to various mining projects to reinforce their classroom / laboratory learning.
5. Sensitization towards ethical, social responsibilities, leadership, entrepreneurship, communication skills and lifelong learning.

Program Educational Objectives (PEOs):

PEO1	Plan and design mine project operations
PEO2	Apply engineering skills/techniques to manage mining operations effectively and able to solve Mining engineering problems..
PEO3	Be able to design/execute all project operations of surface and underground mining projects in an eco-friendly manner. .

Program Specific Outcomes (PSO's):

PSO1	Ability to pursue higher education and research.
PSO2	Develop strong skills in systematic planning, developing, implementing in different domains for betterment of life
PSO3	Plan and operate mining projects by using various engineering/technological tools to meet the volatile needs of the industry.
PSO4	Advance themselves professionally and personally by accepting professional and social responsibilities and pursuing leadership roles.

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Program Outcomes (POs): Engineering
Graduates will be able to:

1	Apply skills/techniques to solve the problems of projects.
2	Critically analyze and interpret the data to solve project problems
3	Plan and design the mine layouts to evaluate the project performance and productivity.
4	Manage & execute the project plans to meet goals of economic, environmental, social, political, ethical, health and safety.
5	Apply latest skills/techniques of computer software, modern instrumentation, novel technologies in engineering activities.
6	Comprehend the efficiency of mines, allied industries and suggest solutions in improving the economics, safety and optimization.
7	Comprehend the professional and ethical values.
8	Comprehend need for higher learning and engage in life-long learning.
9	Make effective communication in verbal and written forms with confidence.
10	Demonstrate leadership in project planning/ execution to obtain quality and quantity.
11	Demonstrate teamwork with other teams of inter-disciplinary department
12	Excel and improvise their skills under challenging circumstances at their projects.

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Course outcomes (Cos) of all courses of all programs offered by the institution

Course outcomes for First Year First Semester Course	
Course Code: 19198101	
Course Title: Mathematics - I	
CO1:	Transform the knowledge of solving system of linear equations using matrices.
CO2:	Evaluate nature of the Quadratic form.
CO3:	Acquire the knowledge maxima and minima of function of several variables.
CO4:	Evaluate multiple integrals and their applications.
CO5:	Understand and apply vector derivatives and vector integration theorems.
Course Code: 19198102	
Course Title: Communicative English-I	
CO1:	Develop effective reading strategies
CO2:	Demonstrate writing skills that are required for professional development and use graphic elements for communication.
CO3:	Apply grammatical skills and vocabulary effectively in speech and writing
CO4:	Display language efficacy in tune with subjective knowledge
CO5:	Use required language along with contextual vocabulary and grammar structures
Course Code: 19198103	
Course Title: Engineering Chemistry	
CO1:	Understand the removal techniques of hardness of water
CO2:	Distinguish the fuel cells and batteries
CO3:	Identify different control techniques of corrosion
CO4:	Understand the concepts of plastics and rubbers
CO5:	Analyse the importance of nanomaterials.
Course Code : 201EE104	
Course Title: Professional ethics and human values	
CO1:	Analyze the ethical dilemmas
CO2:	Apply ethical theories
CO3:	Analyze the moral reasoning
CO4:	Analyze th ethical leadership.
CO5:	Reflect on personal values
Course Code: 19192105	
Course Title: Basic Electrical and Electronics Engineering	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation of DC machines,3-point starter and conduct the Swinburne's Test.
CO3:	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.
Course Code: 191931	
Course Title: Engineering Graphics	
CO1:	Apply principles of drawing to represent dimensions of an object.
CO2:	Outline the polygons and engineering curves.
CO3:	Illustrate projections of points, lines, planes and solids.
CO4:	Illustrate the 3D views through isometric views.
CO5:	Create the isometric views and orthographic views
Course Code: 19198111	
Course Title: Communicative English laboratory	
CO1:	Learn to communicate in English
CO2:	Comprehend native speaker's accent
CO3:	Speak appropriately in real life situations
CO4:	Display public speaking skills in the required context
CO5:	Handle different communicative situations
Course Code: 219198112	
Course Title: Engineering chemistry laboratory	
CO1:	Explain the functioning of the instruments such as pH, conductivity, and potentiometric meters.
CO2:	Determine the total hardness of water
CO3:	Perform various redox titrations.

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CO4:	Preparation of polymers
CO5:	Compare viscosities of different oils
Course Code: 19198214	
Course Title: Basic electrical and electronics engineering lab	
CO1:	Analyze the various electrical networks
CO2:	Understand the operation or DC machines,3 -point starter and conduct the Swinburne's Test.
CO3:	Analyze the performance oi transformer, operation of 3-phase alternator and 3-phase induction motors.
CO4:	Analyze the operation of half Wave, full wave rectifiers, op-amps.
CO5:	Explain the single stage CE amplifier and concept of feedback amplifier.
Course outcomes for First Year Second Semester Course	
Course Code: 19198201	
Course Title: Mathematics – II	
CO1:	Solve first order differential equations.
CO2:	Solve higher order differential equations with constant coefficients
CO3:	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems.
CO4:	Understand numerical differentiation and integration.
CO5:	Apply the knowledge of different algorithms for approximating the solution of ordinary differential equations in practical engineering problems.
Course Code: 19198202	
Course Title: Communicative english - II	
CO1:	Prioritize information from reading texts after selecting relevant and useful points
CO2:	Paraphrase short academic texts using suitable strategies and conventions
CO3:	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
CO4:	Decipher the meaning of unfamiliar text and transform into the familiar form
CO5:	Build the ability to convey in different communicative forms.
Course Code: 19198293	
Course Title: Environmental studies	
CO1:	Gain a higher level of personal involvement and interest in understanding and solving environmental problems
CO2:	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and development activities
CO3:	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO4:	Recognize the interconnections of human dependence on the earths ecosystems
CO5:	Influence their society in proper utilization of goods and services
Course Code: 19193204	
Course Title: Engineering Mechanics	
CO1:	Carry out composition of system of forces.
CO2:	Analyse rigid bodies in static equilibrium condition under system of forces including friction.
CO3:	Determine centre of gravity and moment of inertia of simple and composite planar, solid sections.
CO4:	Carry out dynamic analysis of rigid bodies under translation, rotation and plane motion.
CO5:	Apply work energy and impulse momentum principles to rigid body motion.
Course Code: 19198205	
Course Title: Eengineering Physics and its applications	
CO1:	Fundamental Understanding of Physical Principles
CO2:	Students will learn to apply the principles of physics to real-world engineering problems and technologies
CO3:	Advanced Computational Skills
CO4:	Interdisciplinary Problem-Solving
CO5:	Innovation and Research Capabilities
Course Code: 19195206	
Course Title: problem solving and programming in C	
CO1:	Students will acquire a strong grasp of the C programming language, including its syntax, data types, control structures, functions, and pointers
CO2:	Algorithmic Thinking and Problem-Solving Skills

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CO3:	Debugging and Troubleshooting
CO4:	The course will introduce students to fundamental data structures, such as arrays, linked lists, stacks, and queues
CO5:	Application Development: Students will gain practical experience in developing C-based applications
Course Code: 19198211	
Course Title: Communicative English Laboratory - II	
CO1:	Communicate confidently in English in social and professional contexts with improved skills of fluency and accuracy.
CO2:	Write grammatically correct sentences employing appropriate vocabulary suitable to different contexts
CO3:	Comprehend and analyze different academic texts
CO4:	Meet communicative needs across the globe
CO5:	Identify their skills like leadership, teambuilding and managerial skills
Course Code: 19198212	
Course Title: Engineering physics laboratory	
CO1:	To handle optical instruments like microscope and spectrometer, determine thickness of a hair/paper with the concept of interference and to estimate the wavelength and resolving power of different colours using diffraction grating
CO2:	To demonstrate the importance of dielectric material in storage of electric field energy in the capacitors and plot the intensity of the magnetic field of circular coil carrying current with varying distance
CO3:	To evaluate the acceleration due to gravity using compound pendulum
CO4:	To determine the moment of inertia using Fly wheel
Course Code: 19198213	
Course Title: Basic Engineering workshop	
CO1:	Experiment with various basic house wiring techniques.
CO2:	Develop basic prototype in the trade of tin smithy such as square tray and open scoop.
CO3:	Design v-fitting and square fitting in the trade of fitting
CO4:	Making square rod and L-bend from the round rod in black smithy
CO5:	Build various prototype like T lap joint, dovetail joint, cross lap etc. in the trade of carpentry.
Course Code: 19198214	
Course Title: problem solving and programming in C laboratory	
CO1:	Students will acquire a strong grasp of the C programming language, including its syntax, data types, control structures, functions, and pointers
CO2:	Algorithmic Thinking and Problem-Solving Skills
CO3:	Debugging and Troubleshooting
CO4:	The course will introduce students to fundamental data structures, such as arrays, linked lists, stacks, and queues
CO5:	Application Development: Students will gain practical experience in developing C-based applications

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Course Outcomes for Second Year First Semester Course	
Course Code: 19169301	
Course Title: Mathematics - III	
CO-1	Continuity, analytic and C-R equations of complex function, evaluate Taylor and Laurent series and apply Cauchy residue theorem
CO-2	Understand properties of Laplace and inverse Laplace transformations, apply to solve differential equations
CO-3	Evaluate Fourier series for different functions
CO-4	Understand properties of Fourier transformation apply for different function
CO-5	Classify nature of pde's and solve boundary value problems
Course Code:19163302	
Course Title: Fluid Mechanics & Hydraulic Machinery	
CO-1	Understand the basis fluid properties and fluid flow phenomenon
CO-2	Generate mathematical models of fluid motion including steady, unsteady flow and boundary layer theory
CO-3	State and visualize fluid kinematics.
CO-4	Describe basic working of single and multi-stage air compressors
CO-5	Calculate performance and design of pumps
Course Code: 19160303	
Course Title: Mine Surveying	
CO-1	Measure relative positions of objects below or above the earth surface .
CO-2	Identify the parts of surveying instruments and calculate horizontal, vertical angles
CO-3	Evaluate the elevation of field objects and contour intervals
CO-4	Perform using plane table surveying
CO-5	Utilize modern surveying techniques in field
Course Code: 19160304	
Course Title: Introductory Geology	
CO-1	Understand the role of geology in the design and construction process of underground openings in rock
CO-2	Be able to use knowledge in identifying the minerals basing on physical properties
CO-3	Be able to use knowledge in identifying the minerals basing on optical properties
CO-4	Be able to identify and classify rock using basic geologic classification systems

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CO-5	Be able to apply geologic concepts and approaches on rock engineering projects
Course Code: 19160305	
Course Title: Development of Mineral Deposits	
CO-1	To gain exposure in field of mining activities along with concept relating to history of mining, role of mining in economic development, various mineral exploration techniques, various mining methods and unit operations in mining
CO-2	To gain exposure in various modes of mine access in underground and opencast mining. Basic of bench formation and slope stability
CO-3	To gain exposure in shaft sinking operation in mining. Various factors affecting shaft sinking, various method of shaft sinking including special methods
CO-4	PTo gain exposure for mining development including incline, raise,winze, crosscut,drift etc, ventilation, transportation and lighting arrangements.
CO-5	To gain exposure in field of mining support system.
Course Code:19160306	
Course Title: Drilling & Blasting	
CO-1	Learn the various methods of drilling and rock breakage process.
CO-2	Select appropriate methods of drilling and rock breakage for given in-situ rock conditions
CO-3	Identify relevant requirements for the security, storage and handling of explosives.
CO-4	Design blasts to achieve optimum results; manage and control blast damage and environmental impact.;
CO-5	Apply fundamental principles to the design and selection of safe and efficient blasting.
Course Code:19160387	
Course Title: Design Thinking & Product Innovation	
CO-1	Proficiency in Programming Basics: Students will gain hands-on experience in implementing fundamental programming concept
CO-2	Algorithm Design and Implementation: Through practical exercises, students will learn to design algorithms and translate them into working programs
CO-3	Debugging and Error Handling: The course will equip students with essential debugging skills to identify and fix errors in their programs.
CO-4	Data Structure and Algorithm Practice: Students will be exposed to various data structures, such as arrays, linked lists, stacks, and queues
CO-5	. Software Development Practices: Students will experience the software development lifecycle by

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	working on coding assignments and projects
Course Code:19163311	
Course Title: Fluid Mechanics & Hydraulic Machinery Laboratory	
CO-1	Understand the importance and theory of Fluid mechanics(Level 5)
CO-2	Finding head loss due to friction in pipes by Darcy we is Bach equation (Level 4)
CO-3	Calculating performance analysis in turbines and pumps (Level 3)
CO-4	Conduct experiments (in teams)in pipe flows and open-channel flows and interpreting data from model studies to prototype cases(Level 2)
CO-5	Given the required flow rate and pressure rise, select the proper pump to optimize the pumping efficiency(Level 1)
Course Code:19163312	
Course Title: Mine Surveying Laboratory	
CO-1	Measure relative positions of objects below or above the earth surface
CO-2	Identify the parts of surveying instruments and calculate horizontal, vertical angles.
CO-3	Evaluate the elevation of field objects and contour intervals
CO-4	Perform using plane table surveying
CO-5	Utilize modern surveying techniques in field
Course Outcomes for Second Year Second Semester Course	
Course Code:19169401	
Course Title: Numerical Methods and Probability & Statistics	
CO-1	Apply the knowledge of approximating the roots of polynomial and transcendental equation in practical engineering problems.
CO-2	Apply the Knowledge of different algorithms for approximating the solution of ordinary differential equations in practical Engineering problems
CO-3	Demonstrate the knowledge of Probability distributions.
CO-4	Enhances knowledge of a classical hypothesis techniques.
CO-5	Enhances Knowledge in inferential methods based on small and large sampling tests.
Course Code: 19163466a	
Course Title: Elements of Mining Technology	
CO-1	Know the various Elements of Mining and stages/phases in Mining
CO-2	Know the concepts of Mining Methods.
CO-3	Know the Drilling methods.

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CO-4	Understand the explosives.
CO-5	Blasting practice in mines.
Course Code: 19160402	
Course Title: Advanced Mine Surveying	
CO-1	Understanding the measurements of distances and angles.
CO-2	Able to setting out various curves
CO-3	Measuring the areas and volumes by using various methods.
CO-4	Understanding the various methods of plotting survey
CO-5	Using the advanced surveying techniques of total station.
Course Code: 19160403	
Course Title: Surface Mining	
CO-1	Differentiate various systems of surface mining and their applications
CO-2	Design the opening up of the deposits and Bench formations.
CO-3	Compare various excavating and loading equipment
CO-4	Formulate the production capacities of various HEMM.
CO-5	Apply fundamental principles to the design and selection of safe and efficient blasting.
Course Code: 19160404	
Course Title: Underground Coal Mining	
CO-1	Infer the factors influencing choice of mining methods and possible entries.
CO-2	Perform the development and depillaring operations in bord and pillar mining
CO-3	Summarize the development and extraction using long wall mining method
CO-4	valuate different challenges associated with thick seam mining
CO-5	Plan the extraction of coal using modern mining methods.
Course Code: 19160405	
Course Title: Mining Geology	
CO-1	Outline the engineering concepts of geological and hydrological elements
CO-2	Classify processes of ore minerals formations, origin, occurrence and uses
CO-3	**Infer the basic attribute geology**
CO-4	Relate economic viability of mineral
CO-5	Summarize various prospecting methods for mineral deposit.
Course Code: 19160411	
Course Title: Advanced Mine Surveying Laboratory	
CO-1	Understand the basics of Tachometric survey.

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CO-2	Set out curves by using various surveying methods and instruments.
CO-3	Set out curves by using various surveying methods and instruments.
CO-4	Design the mine plans by using various methods.
CO-5	Correlate surface, underground survey and stop survey.
Course Code: 19160412	
Course Title: Mining Geology Laboratory	
CO-1	Observe and analyse the Geo-morphology and geological structure of a particular area
CO-2	Measure attitude of bed using physical properties
CO-3	Examine the mineral physical properties
CO-4	Identify the mega scope properties of rocks
CO-5	Categorize the geological formations
CO-1	Observe and analyse the Geo-morphology and geological structure of a particular area
Course Outcomes for Third Year First Semester Course	
Course Code: 19160501	
Course Title: Mining systems engineering	
CO-1	Solve the real-life problems on Linear programming and allocation
CO-2	Comprehend the transportation, assignment, sequencing and replacement concepts
CO-3	Comprehend the concept of games, waiting lines.
CO-4	Comprehend and analyze inventory and break-even analysis.
CO-5	Solve dynamic programming problems and understand the concept of simulation
Course Code: 19160502	
Course Title: Underground Metal Mining	
CO-1	Comprehend the terminology used in underground metal mining, their scope and limitation
CO-2	Comprehend the terminology used in underground metal mining, their scope and limitation
CO-3	Summarize the raising methods used in underground metal mining.
CO-4	Summarize the raising methods used in underground metal mining.
CO-5	Discuss different special stopping methods, their applicability with limitations.
Course Code: 19160503	
Course Title: Mine Ventilation	
CO-1	Comprehend the mine atmosphere, monitoring, and its control

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CO-2	Comprehend the mine atmosphere, monitoring, and its control
CO-3	Comprehend the mine atmosphere, monitoring, and its control
CO-4	Interpret and perform the mine ventilation survey.
CO-5	Comprehend the mine atmosphere, monitoring, and its control
Course Code:19160504	
Course Title: Mine Planning & Design	
CO-1	Comprehend and plan different stages in new mines.
CO-2	Analyse and prepare different plan reports.
CO-3	Interpret the design, planning of ventilation and infrastructure in mines.
CO-4	Analyse the concept of open-pit design.
CO-5	Comprehend the process of mine reclamation, rehabilitation, and corporate social responsibility
Course Code:19160565A	
Course Title: Mine Transportation (Professional Elective-1)	
CO-1	Assess the principles, operations and application of conveyors..
CO-2	Demonstrate different types of rope haulage and its application.
CO-3	Identify various locomotive haulage systems
CO-4	Demonstrate various types of winding systems in mine
CO-5	Comprehend skip and koepe winding in mines.
Course Code: 19160565B	
Course Title: Mine Valuation (Professional Elective-1)	
CO-1	Comprehend and practice mine management aspects.
CO-2	Appraise the importance of personal management and human relations
CO-3	Perform work study environment and comprehend operation management
CO-4	Outline the concepts of behavioural sciences for management.
CO-5	comprehend the principles of maintenance and marketing management.
Course Code: 19160565C OKKKK	
Course Title: Rock Excavation(Professional Elective-1)	
CO-1	Comprehend the rock breaking theory.
CO-2	Summarize rock properties related to rock excavation.
CO-3	Appraise the technology used in rock cutting
CO-4	Classify various rock cutting tools and their applications
CO-5	Compare various rock excavating machines

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Course Code: 19160565D	
Course Title: Advanced Coal Mining (Professional Elective-1)	
CO-1	Comprehend the coal face mechanization
CO-2	Summarize the problems associated with thick seam mining
CO-3	Appraise the technology used in hydraulic mining.
CO-4	Classify various long wall mining methods and their applications.
CO-5	Comprehend underground coal gasification.
Course Code: 19160565E	
Course Title: Environmental Pollution & Control in Mines (Professional Elective-1)	
CO-1	Assess air pollution in mines.
CO-2	Comprehend water pollution in mines.
CO-3	Appraise the importance of noise pollution in mines.
CO-4	Perform the biological land reclamation
CO-5	Perceive the basic information required for the preparation of environmental impact Assessment and environmental management plan.
Course Code: 19160511	
Course Title: Mine Ventilation Lab	
CO-1	Comprehend the mine atmosphere, monitoring and its control.
CO-2	Evaluate the various mine heat sources and cooling system in mines.
CO-3	Compare different types of natural and mechanical ventilation systems.
CO-4	Interpret and perform the mine ventilation survey.
CO-5	Perform the tests using various flame safety lamps.
Course Code: 19160512	
Course Title: Mine Planning and Design Lab	
CO-1	Comprehend and plan different stages in new mines..
CO-2	Analyse and prepare different plan reports.
CO-3	Interpret the design, planning of ventilation and infrastructure in mines.
CO-4	Analyse the concept of open-pit design.
CO-5	Calculate the production obtained by using various machinery in mines.
Course Code: 19160521	
Course Title: Mini Project-1/Study Project/Internship	
CO-1	Practical Application of Theoretical Concepts: Students will have the opportunity to apply the theoretical

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	knowledge gained during their coursework to real-world situations
CO-2	Problem-Solving and Analytical Skills: Through their mini project, study project, or internship, students will develop problem-solving and analytical skills
CO-3	Project Management and Time-Management: Engaging in a mini project or internship will expose students to project management principles and time-management techniques
CO-4	Collaboration and Communication: Working on a mini project or internship will foster collaboration and effective communication skills. Students will often collaborate with peers, mentors, or industry professionals, allowing them to practice teamwork and effectively convey their ideas and progress.
CO-5	Professional Development: The mini project, study project, or internship experience will contribute significantly to students' professional development. It will help them build a portfolio of practical work, enhance their resume, and provide valuable insights into their chosen field of study or industry.

Course Outcomes for Third Year Second Semester Course	
Course Code: 19160601	
Course Title: Rock Mechanics	
CO-1	Appraise the importance of rock mechanics and physio-MINING properties of rock
CO-2	Analyse the stress-strain in rocks.
CO-3	Outline inset stress measurement techniques and geophysical investigation methods
CO-4	Differentiate among various rock mass classifications and rock failure criterion.
CO-5	Analyse the various modes of slope failure and its stabilization techniques.
Course Code: 19160602	
Course Title: Mineral Processing	
CO-1	Classify various sampling methods..
CO-2	Comprehend and explain the settling of solids.
CO-3	Appraise the beneficiation process and its applications.
CO-4	Appraise the beneficiation process and its applications.
CO-5	Comprehend and analyze the efficiency of operations in mineral processing industries.
Course Code: 19160603	
Course Title: Mineral Economics	
CO-1	Summarize the various policies, acts and conservation rules on minerals.
CO-2	Analyze the mineral taxation laws and pricing mechanism of minerals.
CO-3	Interpret various sampling methods.
CO-4	Estimate the reserves using various estimation methods.
CO-5	Analyze the mine finance and model optimum size of mine.
Course Code: 19160664A	
Course Title: Planning of Surface Mines(Professional Elective-2)	
CO-1	Comprehend the stages of mine planning and planning inputs.

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CO-2	Estimate ore reserve and stripping ratio.
CO-3	Outline the geometrical considerations of bench and pit.
CO-4	Assess the design parameters of dump slope and determine optimum mine size.
CO-5	Plan and design haul roads in mines.
Course Code: 19160664B	
Course Title: . Enterprise Resource Planning (Professional Elective-2)	
CO-1	Infer ERP and related technologies with applications
CO-2	Explain Product life cycle, ERP implementation, evaluation and selection.
CO-3	Outline different ERP business modules.
CO-4	Explain the ERP post implementation effects in Business environments.
CO-5	Comprehend the emerging future trends in ERP systems.
Course Code: 19160664C	
Course Title: Mine Strata Control (Professional Elective-2)	
CO-1	Assess the pre and post mining stresses, strata behaviour in mines.
CO-2	Classify the various support systems in underground mines.
CO-3	Distinguish the different methods of stowing in development and depillaring operations.
CO-4	A Relate the theories of ground movement.
CO-5	Comprehend the mechanism of subsidence and its prevention's
Course Code: 19160664D	
Course Title: Innovative Mining Systems(Professional Elective-2)	
CO-1	Comprehend and analyze the technological life cycle of mine operations.
CO-2	Appraise the basics of system dynamics involved in innovative mine systems.
CO-3	Comprehend the new developments in mine operations..
CO-4	Apprehend the new frontiers of mining in real world
CO-5	Design and introduce automation and robotics in mine operation.
Course Code: 19160664E	
Course Title: Environmental Impact Assessment in Mines(Professional Elective-2)	
CO-1	Comprehend the concept of environmental impact assessment.
CO-2	Assess the types and limitations of environmental impact assessment..
CO-3	Identify the components of environmental impact assessment.
CO-4	Predict the impacts of environmental impact assessment.
CO-5	Appraise the statutory requirement for mine environment management.

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Course Code:19163665a	
Course Title: Renewable Energy Resources Open Elective – 3	
CO-1	Analyze solar radiation data, extra-terrestrial radiation, radiation on earth's surface
CO-2	Design solar thermal collections.
CO-3	Develop maximum power point techniques in solar PV and wind
CO-4	Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitation
Course Code:19160621	
Course Title: Community Service Oriented Project	
CO-1	Social Awareness and Empathy: Engaging in a community service project will help students develop a deeper understanding of social issues and challenges faced by different communities
CO-2	Active Citizenship and Civic Engagement: Through the community service project, students will learn about the importance of active citizenship and civic responsibility.
CO-3	Teamwork and Collaboration: Working on a community service project often involves collaborating with diverse groups of people. Students will learn to work effectively in teams, appreciate diverse perspectives, and leverage collective strengths to achieve common goals.
CO-4	Problem-Solving and Project Management: Engaging in a community service project will require students to identify challenges and find solutions. They will develop problem-solving skills and learn project management techniques to plan, implement, and assess the impact of their initiatives
CO-5	Personal Growth and Reflection: The community service project will offer students opportunities for personal growth and self-reflection
Course Code: 19169686	
Course Title: Soft Skills	
CO-1	Effective Communication
CO-2	Teamwork and Collaboration
CO-3	leadership and Emotional Intelligence
CO-4	Time Management and Organizational Skills
CO-5	Problem-Solving and Critical Thinking
Course Code: 201MM613	
Course Title: Rock Mechanics Laboratory	
CO-1	Prepare rock samples for testing
CO-2	Comprehend the Physico-MINING properties of rock.
CO-3	Determine the methods to measure the different strength parameters of rock
CO-4	Estimate the weathering effects on rock

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CO-5	Estimate the drill-ability index of rocks.
Course Code: 19160612	
Course Title: Mineral Processing Laboratory	
CO-1	Hands-On Experience with Mineral Processing Equipment: Students will gain practical experience in operating and troubleshooting various mineral processing equipment, such as crushers, screens, grinding mills, and flotation cells
CO-2	Ore Characterization and Analysis: Through laboratory experiments, students will learn to characterize different types of ores
CO-3	Process Optimization and Control: Students will learn how to optimize mineral processing flowsheets and control the process variables to maximize mineral recovery and concentrate grade
CO-4	Safety and Environmental Awareness: The laboratory exercises will emphasize safety protocols and environmental considerations in mineral processing
CO-5	Data Analysis and Reporting: Students will develop skills in collecting and analyzing experimental data, interpreting results, and preparing comprehensive reports
Course Outcomes for Fourth Year First Semester Course	
Course Code:19160701	
Course Title: Mine Legislation and General Safety	
CO-1	Comprehend the concepts of hazard and disaster management
CO-2	Assess the types of hazards and their consequences
CO-3	Comprehend the approaches and measures in disaster management.
CO-4	Distinguish various techniques in disaster management
CO-5	Comprehend the statutory provisions related to disaster management in India.
Course Code:19160702	
Course Title: Mining Machinery	
CO-1	Assess air pollution in mines.
CO-2	Comprehend water pollution in mines.
CO-3	Appraise the importance of noise pollution in mines.
CO-4	Perform the biological land reclamation
CO-5	Perceive the basic information required for the preparation of environmental impact assessment and environmental management plan.
Course Code: 19160703	
Course Title: Computer Applications in Mining	
CO-1	Summarize the various policies, acts, and conservation rules on minerals.
CO-2	Analyze the mineral taxation laws and pricing mechanism of minerals.
CO-3	Interpret various sampling methods

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CO-4	Estimate the reserves using various estimation methods.
CO-5	Analyze the mine finance and model optimum size of mine.
Course Code:19160764A	
Course Title: Mine Construction Engineering (Professional Elective-3)	
CO-1	Outline the geological investigations in mine.
CO-2	Comprehend the laying out of shaft lining.
CO-3	Appraise the design and construction of insets
CO-4	Comprehend the mechanization of underground operations.
CO-5	Comprehend the mechanization of underground operations
Course Code: 19160764B	
Course Title: Geo statistics (Professional Elective-3)	
CO-1	Comprehend the schools of Geo statistics, estimation models for mine evaluation.
CO-2	Interpret semi-variogram and co-variogram.
CO-3	Comprehend the extension variance and estimation variance
CO-4	Analyze the integrated geological-geo statistical system
CO-5	Identify the geo statistical applications.
Course Code: 19160764C	
Course Title: Rock slope Engineering (ProfessionalElective-3)	
CO-1	Comprehend and analyze the parameters affecting slope stability.
CO-2	Appraise the influence of water on stability of slopes
CO-3	Comprehend and analyze the mechanism of different types of slope failure
CO-4	Identify the monitoring and stabilization methods to prevent slope failure.
CO-5	Demonstrate the numerical modelling of slope stability
Course Code: 19160764D	
Course Title: Tunnelling Engineering(Professional Elective-3)	
CO-1	Appraise tunnelling engineering in underground openings.
CO-2	Comprehend and analyze the mechanism of tunnelling engineering
CO-3	Identify various drilling and blasting methods used in tunnel engineering.
CO-4	Identify different equipment used in tunnel engineering.
CO-5	Design the support systems in tunnel engineering.

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Course Code: 19160764E	
Course Title: . Mine Safety Engineering (Professional Elective-5)	
CO-1	Outline typical accidents prone to occur in mines.
CO-2	Analyse various accidents associated with mining works.
CO-3	Comprehend about statutory safety requirements in mines.
CO-4	Summarize safety and risk management practices in mines.
CO-5	Infer typical miners' health issues, occupational diseases and their prevention
Course Code: 19169765g	
Course Title: . Total Quality Management (open Elective-4)	
CO-1	Understanding Total Quality Management (TQM) Principles
CO-2	Implementation of Quality Systems
CO-3	Quality Control and Assurance in Mining
CO-4	Safety and Environmental Considerations
CO-5	Leadership and Change Management: Students will develop leadership skills and an understanding of change management principles in the context of implementing TQM in mining
Course Code: 19160711	
Course Title: Computer applications in mining laboratory	
CO-1	Comprehend the usage of software in various mining operations.
CO-2	Design pillars, dumps and slopes using numerical modeling..
CO-3	Comprehend the concepts of CPM/ PERT and blast optimization.
CO-4	Plan and design open cast and underground mines.
CO-5	Comprehend the usage of software in various mining operations.
Course Code: 19160712	
Course Title: Mining Machinery Laboratory	
CO-1	Identify various wire ropes used in mines
CO-2	Plan transport systems and safety devices
CO-3	Demonstrate gate end box and various cables used mines
CO-4	Plan and design different types of support systems
CO-5	Distinguish different types of support systems

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Course Code: 201MM763D	
Course Title: Mine Valuation (Professional Elective-5)	
CO-1	Appraise the economic importance of mineral industry.
CO-2	Distinguish the various methods of mine valuation
CO-3	Evaluate the economic feasibility of a mining project.
CO-4	Summarize the methods of project evaluation.
CO-5	Infer various sources of mine fund and cost control methods.
Course Code: 19160721	
Course Title: Mini project 2/ summer internship	
CO-1	In-Depth Application of Mining Engineering Principles: Students will demonstrate a comprehensive understanding of mining engineering concepts and principles acquired throughout their B.Tech program.
CO-2	Project Planning and Management: Through the final project, students will gain experience in project planning and management
CO-3	Practical Problem-Solving Skills: The final project will require students to identify, analyze, and solve complex mining engineering problems
CO-4	Research and Data Analysis: Students will conduct in-depth research on their chosen mining engineering topic and use data analysis techniques to draw meaningful conclusions.
CO-5	Technical Communication and Presentation: The final project will enhance students' technical communication and presentation skills.
Course Outcomes for Fourth Year Second Semester Course	
Course Code: 19160861A	
Course Title: Planning of Underground Metal Mines (Professional Elective-4)	
CO-1	Plan and schedule the working of an Underground metal mine.
CO-2	Comprehend and drive levels
CO-3	Analyze underground metal mining equipment selection & support
CO-4	Demonstrate the transportation system in underground metal mines.
CO-5	Design the layouts of working of underground metal mines.
Course Code:19160861B	
Course Title: Mine Management (Professional Elective-4)	
CO-1	Comprehend and practice mine management.
CO-2	Appraise the importance of personal management and human relations.
CO-3	Perform work study environment and comprehend operation management.
CO-4	Outline the concepts of behavioural sciences for management.

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CO-5	Comprehend the principles of maintenance and marketing management.
Course Code:19160861C	
Course Title: Mine Subsidence Engineering (Professional Elective-4)	
CO-1	Comprehend and analyze the subsidence mechanism.
CO-2	Outline the different methods of subsidence prediction.
CO-3	Assess the time influence of subsidence and impact on structures.
CO-4	Summarize the effects of subsidence.
CO-5	Outline the methods to control subsidence.
Course Code:19160861D	
Course Title: Dimensional Stone Mining(Professional Elective-4)	
CO-1	Comprehend the concept of dimensional stone mining.
CO-2	Analyze the different methods of dimensional stone mining
CO-3	Identify the various equipment used in dimensional stone mining.
CO-4	Assess the different environmental issues.
CO-5	Summarize the applications of dimensional stone mining
Course Code:19160861E	
Course Title: Environmental Management in Mines(Professional Elective-4)	
CO-1	Outline the environmental issues in mineral industry
CO-2	Interpret the air and water pollution in mines.
CO-3	Assess the importance of noise pollution in mines.
CO-4	Comprehend and analyse the biological land reclamation.
CO-5	Perceive the basic information required f or the preparation of environmental impact assessment and environmental management plan.
Course Code:19160862A	
Course Title: Open Pit Slope Analysis and Design (Professional Elective-5)	
CO-1	Classify various modes of slope failure.
CO-2	Comprehend and analyse the geotechnical parameters required for slope stability analysis.
CO-3	Interpret the shear strength of intact rock mass and jointed rock mass.
CO-4	Analyse the flow of water in slope stability.
CO-5	Summarize various methods and techniques used to assess the slope stability.

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Course Code:19160862B	
Course Title: Waste Management (Professional Elective-5)	
CO-1	Identify the collection systems of solid waste of a town.
CO-2	Design and plan municipal solid waste treatment and landfill
CO-3	Identify the criteria for selection of landfill
CO-4	Analyze the solid waste and design a composting facility
CO-5	Demonstrate the different processing and treatment techniques of tailings
Course Code:19160862C	
Course Title: Rock Fragmentation Engineering(Professional Elective-5)	
CO-1	Comprehend the concept of rock breaking theory.
CO-2	Comprehend and analyze the mechanism of different types of rock drilling
CO-3	Analyze the mechanism of rock fragmentation.
CO-4	Comprehend the techniques of the blast design.
CO-5	Outline the techniques of controlled blasting
Course Code:19160862D	
Course Title: Deep Sea Mining(Professional Elective-5)	
CO-1	Comprehend the process of mining of shallow and deep-sea mineral resources.
CO-2	Analyze the profile of sea with the mineral deposits.
CO-3	Comprehend and predict the nature of continental shelf, slope sea floor, and mining conditions.
CO-4	Comprehend and Analyze the production of oil and natural gas from sea mining
CO-5	Outline the environmental impacts of deep-sea mining
Course Code:19160862E	
Course Title: Mine Hazards and Rescue (Professional Elective-5)	
CO-1	Outline the techniques to control spontaneous heating and mine fires in mines.
CO-2	Comprehend the techniques to prevent explosion
CO-3	Comprehend and analyze the techniques to prevent inundation in mines
CO-4	Summarize the techniques of mine rescue and recovery work
CO-5	Outline the different methods of mine illumination
Course Code:19160841	
Course Title : Project work	
CO-1	In-Depth Application of Mining Engineering Principles: Students will demonstrate a comprehensive

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	understanding of mining engineering concepts and principles acquired throughout their B.Tech program.
CO-2	Project Planning and Management: Through the final project, students will gain experience in project planning and management
CO-3	Practical Problem-Solving Skills: The final project will require students to identify, analyze, and solve complex mining engineering problems
CO-4	Research and Data Analysis: Students will conduct in-depth research on their chosen mining engineering topic and use data analysis techniques to draw meaningful conclusions.
CO-5	Technical Communication and Presentation: The final project will enhance students' technical communication and presentation skills.

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1.1.1: Curricula developed and implemented have relevance to the local, regional, national, and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes(COs) of the Programmes offered by the institution



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PEOs, PSOs & COs

GR-17 CIVIL ENGINEERING

Department Vision: To be the best Civil Engineering department in the region by means of good teaching, research and consultancy that serves the society.

Department Mission:

- Arranging field visits, guest lectures and interactive sessions with subject experts
- Creating a strong bond between industrial needs and academic research outcomes
- Undertaking collaborative projects which offer opportunities for long-term interaction between academia and industry
- Promoting the career of the faculty members by encouraging their research work
- Adopting best teaching practices, imparting employability skills and empowering to become entrepreneurs in the trade.

Program Educational Objectives (PEOs):

PEO1	Learning new technologies and/or undertaking higher education.
PEO2	Leading a team of engineers in executing projects.
PEO3	An entrepreneur in civil engineering community and/or a leadership role exhibiting systematic approach to resolve societal problems with ethical values.

Program Educational Objectives (PSOs):

PSOs	• PSO1: Get proficiency in management and communication skills to become an entrepreneur. • PSO2: Ability to use earth sciences in execution of civil engineering projects.

Program Outcomes (POs): Engineering Graduates will be able to:

- PO-1. Apply knowledge of computing, mathematics, science and engineering basics related to Civil Engineering.
- PO-2. Identify the problems and analyse the solutions by simulating, conducting experiments and interpreting data.
- PO-3 Design civil engineering structures to meet industrial needs.
- PO-4 Explore and investigate contemporary engineering problems and proposed solutions.
- PO-5 Use latest techniques, skills and modern machinery for engineering practices.
- PO-6 Propose civil engineering solutions to solve societal problems.
- PO-7 Design sustainable systems in congruence with social and environmental issues.
- PO-8 Practice professional ethics with legal awareness and societal responsibilities.
- PO-9 Work as an individual or in a team to achieve targets.
- PO-10 Articulate thoughts and ideas effectively at different levels.
- PO-11 Manage financial and human resources for better execution of project.
- PO-12 Participate in lifelong learning process.

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Course outcomes for First Year First Semester Course	
Course Code: 17199101	
Course Title: English - I	
CO1:	To apply their learning in different fields and can serve the society accordingly
CO2:	Identifysafetymeasuresagainstdifferentkindsofaccidentsathomeand also in the workplace
CO3:	Experiment the usefulness ofanimals forthehuman society
CO4:	Appraise writing skills that is required for professional development
Course Code: 17199111	
Course Title: English – Communication skills lab – I	
CO1:	Appraise the importance of functional English
CO2:	Relation his knowledge to the competitive world
CO3:	Identify the necessity to follow native speakers accent
CO4:	Experiment how the communicative items in the laboratory will help the students to be effective communicators.
Course Code: 17199102	
Course Title: Mathematics - I	
CO1:	Solve linear differential equations of first order and higher order with constant coefficients
CO2:	Apply Laplace transform and inverse Laplace transform to determine particular solution of ODE
CO3:	Solve first and higher order linear PDE in various applications.
Course Code: 17199105	
Course Title: Mathematics - II	
CO1:	Apply Numerical techniques to solve algebraic and transcendental equations and also IVPs in ODE
CO2:	Calculate the tabulated date at the given values using various Interpolation techniques
CO3:	Derive and apply C – R equations
CO4:	Execute a given function of Fourier series and use finite and infinite Fourier Integral transforms to solve BVPS
Course outcomes for First Year Second Semester Course	
Course Code: 17199205	
Course Title: Mathematics – III	
CO1:	Apply matrix theory to linear systems of equations and identify Eigen values and Eigen vectors to solve Eigen value problems.
CO2:	Evaluate and apply the multiple integrals
CO3:	Apply Beta &Gamma functions and evaluate Improper integrals.
CO4:	Implement vector Differentiation and Integration in Physical and Engineering Situations
Course Code: 17199202	
Course Title: Engineering Physics	
CO1:	Identify the difference between spontaneous and stimulated emissions
CO2:	Illustrate the functions of Nano materials and nanotechnology
CO3:	Apply quantum mechanics in computer technology and experiment the uses of fundamentals of quantum mechanics
CO4:	Demonstrate the knowledge of semiconductor physics in diode to Chip technology
Course Code:17199212	
Course Title: Engineering Physics Laboratory	
CO1:	Practice the concept of propagation of light and how light will be diffracted by using the experiments like Newton's rings and grating experiments
CO2:	Experiment the concept of acceleration due to gravity by using compound pendulum
CO3:	Apply Stewart and Gee's apparatus that gives knowledge about the magnetic field
Course Code: 17198204	
Course Title: Engineering Chemistry	
CO1:	Examine the importance of fundamentals of Water Technology
CO2:	Identify the reasonsforcorrosionandsomeofcorrosioncontrolmethods.
CO3:	Classify the advantages and limitations of polymers, plastic materials and their use in Engineering design
CO4:	Experiment theimportanceofgreensynthesisandhow it is differentfromconventionalmethods and alsoawareofnano-materialsandcement technology
Course Code: 17198213	
Course Title: Engineering Chemistry Laboratory	
CO1:	Experiment volumetric analysis and titrations with different indicators

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CO2:	Analyse a few instrumental methods of chemical analysis
CO3:	Demonstrate different methods of chemical analysis and use of some commonly employed instruments.
Course Code: 17199201	
Course Title: English – II	
CO1:	Analyse that the lesson underscores the ultimate aim of education is to enhance wisdom
CO2:	Experiment the lessons to promote peaceful co – existence and universal harmony among people and society.
CO3:	Relate the achievements of C V Raman that are inspiring and exemplary.
Course Code: 17199211	
Course Title: English – Communication Skills Lab - II	
CO1:	Analyse the importance of communication
CO2:	Experiment the importance of LSRW skills
CO3:	Apply the necessary skills to face job interviews
Course outcomes for Second Year First Semester Course	
Course Code: 17112301	
Course Title: Basic Electrical & Electronics Engineering	
CO 1:	Able to analyse the various electrical networks
CO 2:	Able to understand the operation of DC generators,3-point starter and conduct the Shinbone's Test
CO 3:	Able to analyse the performance of transformer, operation of 3-phase alternator and 3-phase induction motors
CO 4:	Able to analyse the operation of half Wave, full wave rectifiers, op-amps and explain the single stage CE amplifier and concept of feedback amplifier.
Course Code: 17110302	
Course Title: Building Materials and Constructions	
CO 1:	Describe the types and properties of various building materials -stones, clay products, Timber, metals, cement and concrete and their applications in building industry.
CO 2:	Select the appropriate' building materials to suit to the structural requirements including exposure conditions.
CO 3:	Describe the various components of buildings.
CO 4:	Select the appropriate construction methods to meet the local conditions.
CO 5:	Describe the various types of stairs and stair cases and their locations, sizes and materials including fire escapes and also lifts and escalators.
CO 6:	Describe the various methods of shuttering, scaffolding and centring.
CO 7:	Describe the various types expansion and construction joints and their construction.
Course Code: 17110303	
Course Title: Building Planning & Drawing	
CO 1:	Explain principles of building planning
CO 2:	Explain the procedure of building planning incorporating climatic and functional aspects.
CO 3:	Design/compose various rooms in a building considering the functional requirements.
CO 4:	Design and draw the plans, sections and elevations of residential and simple public buildings.
Course Code: 17110304	
Course Title: Strength of Materials-I	
CO 1:	Understand the basic materials behaviour under the influence of different external loading conditions and the support conditions
CO 2:	Draw the diagrams indicating the variation of the key performance features like bending moment and shear forces.
CO 3:	Have knowledge of bending concepts and calculation of section modulus and for determination of stressed developed in the beans due to various loading conditions
CO 4:	Assess stresses across section of the thin and thick cylinders to arrive at optimum sections to withstand the internal pressure
CO 5:	Apply Green's theorem top for determination of forces beams subjected to distributed loads
Course Code: 17110305	
Course Title: Surveying	
CO 1:	Demonstrate the basic surveying skills
CO 2:	Use various surveying instruments.
CO 3:	Perform different methods of surveying

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CO 4:	Compute various data required for various methods of surveying.
CO 5:	To integrate the knowledge and produce topographical map.
Course Code: 17110306	
Course Title: Fluid Mechanics	
CO 1:	Solve manometer problems, and calculate force on submerged bodies.
CO 2:	Use conservation of mass principle to calculate flow rates through control volumes.
CO 3:	Use Bernoulli's equation to solve simple problems
CO 4:	calculate the lift and drag forces for various objects
CO 5:	Apply appropriate equations and principles to analyse a variety of pipe flow situations.
CO 6:	Predict the flow 'rate in a pipe by use of common flow meters.
Course Code: 17110311	
Course Title: Surveying - Field Work	
CO 1:	To demonstrate the basic surveying skills
CO 2:	To use various surveying instruments.
CO 3:	To perform different methods of surveying
CO 4:	To compute various data required for various methods of surveying.
CO 5:	To integrate the knowledge and produce topographical map.
Course Code: 17110312	
Course Title: Strength of Materials Lab	
CO 1:	To determine the engineering properties of materials in the laboratory.
CO 2:	To conduct laboratory tests to verify the suitability of the engineering materials for the given purpose.
CO 3:	To verify the basic principles of behaviour of materials.
CO 4:	To verify the quality of materials through laboratory tests.
Course outcomes for Second Year Second Semester Course	
Course Code: 17119401	
Course Title: Statistics through R -Programming	
CO 1:	Probability and Statistics for Engineers: Miller and John E. Freund, Prentice Hall of India
CO 2:	Probability and Statistics for Engineers and Scientists: Ronald E. Walpole, Sharon L. Mayers and Keying Ye: Pearson
CO 3:	Probability Statistics and Random Processes, Murugesan, Anuradha Publishers, Chennai
CO 4:	Probability, Statistics and decision making for Civil Engineering by Benjamin &Franking
Course Code: 17110402	
Course Title: Strength of Materials-II	
CO 1:	The student will be able to understand the basic concepts of Principal stresses developed when subjected to stresses along different axes and design the sections.
CO 2:	The student can assess stresses in different engineering applications like shafts, springs, columns and struts subjected to different loading conditions.
CO 3:	The student will be able to assess forces in different types of trusses used in construction.
Course Code: 17110403	
Course Title: Hydraulics and Hydraulic Machinery	
CO 1:	Solve uniform open channel flow problems
CO 2:	Apply dimensional analysis and similitude in order to account for the implications of scale in model experiment.
CO 3:	Calculate depth profiles in channels with steady gradually – varied flow.
CO 4:	Understand the working principles of various hydraulic machineries.
	Select the appropriate turbines and pumps to meet the field requirements
Course Code: 17110404	
Course Title: Concrete Technology	
CO 1:	Understand the basic concepts of concrete.
CO 2:	Realise the importance of quality of concrete.
CO 3:	Familiarise the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field.
CO 4:	Test the fresh concrete properties and the hardened concrete properties.
CO 5:	Evaluate the ingredients of concrete through lab test results.
CO 6:	Design the concrete mix by BIS method.
CO 7:	Familiarise the basic concepts of special concrete and their production and applications.
CO 8:	Understand the behaviour of concrete in various environments.
Course Code: 17110405	

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Course Title: Structural Analysis - I	
CO 1:	Differentiate determinate and indeterminate structures.
CO 2:	Identify the behaviour of structures due to the expected loads, including the moving loads, acting on the structure
CO 3:	Estimate the bending moment and shear forces in beams for different boundary conditions.
CO 4:	Analyse the continuous beams using various methods-, three moment method, slope deflection method, energy theorems.
CO 5:	Draw the influence line diagrams for various types of moving loads on beams/bridges.
CO 6:	Analyse the loads in Pratt and Warren trusses when loads of different types and spans are passing over the truss.
Course Code: 17110406	
Course Title: Environmental Engineering - I	
CO 1:	Plan and design the water and distribution networks.
CO 2:	Identify the water source and select proper intake structure.
CO 3:	Characterization of water.
CO 4:	Select the appropriate appurtenances in the water supply.
CO 5:	Selection of suitable treatment flow for raw water treatments.
Course Code: 17110411	
Course Title: Fluid Mechanics and Hydraulic Machinery Lab	
CO 1:	Calibrate various discharge measurement meters in a open channel flow.
CO 2:	Measure the discharge through an open channel.
CO 3:	Draw performance curves by conducting experiments on various hydraulic machineries.
CO 4:	Conduct efficiency and performance tests on turbines and pumps.
Course Code: 17110412	
Course Title: Concrete Technology Lab	
CO 1:	Determine the consistency and fineness of cement.
CO 2:	Determine the setting times of cement.
CO 3:	Determine the specific gravity and soundness of cement.
CO 4:	Determine the compressive strength of cement.
CO 5:	Determine the workability of cement concrete by compaction factor, slump and Vee – Bee tests
CO 6:	Determine the specific gravity of coarse aggregate and fine aggregate by Sieve analysis.
CO 7:	Determine the flakiness and elongation index of aggregates.
CO 8:	Determine the bulking of sand.
CO 9:	Understand the non-destructive testing procedures on concrete.

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GR-17 ELECTRONICS & COMMUNICATIONS ENGINEERING

Department Vision:

Create an educational environment to mound the students to meet the challenges of modern Electronics & Communication industry through state of the art Technical knowledge and Innovative experimental Approaches.

Department Mission:

1. To create learning, development and testing environment to meet ever challenging needs of the Electronic industry
2. To create entrepreneurial environment and industry Interaction for Mutual benefit
3. To become a global partner in training human resources in the fields of chip design, instrumentation and networking
4. To associate with internationally reputed Institutions for Academic excellence and collaborative Research

Program Educational Objectives (PEOs):

PEO1	To prepare students with excellent comprehension of basic Sciences, mathematics and engineering subjects facilitating them to gain employment or pursue postgraduate studies with an appreciation for lifelong learning.
PEO2	To train students with problem solving capabilities such as analysis and design with adequate practical skills wherein they demonstrate creativity and innovation that would enable them to develop state of the art equipment and technologies of multidisciplinary nature for societal development.

Program Specific Outcomes (PSO's):

PSO1	Analyze and design analog and digital circuits or systems for a given specification and function.
PSO2	Implement functional blocks of hardware-software co-designs for signal processing and communication applications.

Program Outcomes (POs): Engineering Graduates will be able to:

1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate

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	consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustain able development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes for First Year First Semester Course	
Course Code: 17199102	
Course Title: Mathematics – I	
CO-1	Transform the knowledge of solving system of linear equations using matrices.
CO-2	Apply mean value Rolls, Lagranges and Cauchy mean value theorem in engineering applications.
CO-3	Acquire the knowledge maxima and minima of function of several variables
Course Code: 17199103	
Course Title: Computer programming	
CO-1	To obtain the knowledge about different languages used in computer programming and also about the number systems which will be very useful for bitwise operations and basic terminology used in the computer programming.
CO-2	To obtain knowledge about algorithm, flow chart, and structure of C program and different C tokens used inside C program.
CO-3	To develop program by using Control structure, different looping and Jump statement
CO-4	To obtain knowledge about the application and implementation of 2-dimentional Array and string inside the program.
Course code: 17199104	
Course Title: Engineering Drawing	

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CO-1	To understand the concepts and use of drawing Instruments and Curves used in Engineering Practice.
CO-2	To understand the concepts of Vernier and Diagonal scales and concepts of orthographic projections.
CO-3	To understand the concepts of Projections of isometric views to orthographic views
Course code: 17199111	
Course Title: English Communication Skills Lab-I	
CO-1	Paraphrase short academic texts using suitable strategies and conventions
CO-2	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
Course Outcomes for First Year Second Semester Course	
Course code:17199201	
Course Title: English – II	
CO-1	Paraphrase short academic texts using suitable strategies and conventions
CO-2	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements.
CO-3	Build the ability to convey in different communicative forms.
Course code:17199202	
Course Name: Engineering Physics	
CO-1	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics
Course code:17195105	
Course Name: Mathematics –II	
CO-1	Apply the knowledge of descriptive statistics and method of data science in practical engineering problems.
CO-2	Demonstrate the knowledge of Probability distributions.
Course Outcomes for Second Year First Semester Course	
Course Code: 17142302	
Course Title: Network Analysis	
CO-1	analyze network, network topology and various network reduction techniques
CO-2	understand AC fundamentals, steady-state analysis of AC circuits, magnetic circuits and resonance concepts
CO-3	apply network theorems to both DC and AC networks and know about various two-port network parameters
Course Code: 17140304	
Course Title: Electronic Devices and Circuits	
CO-1	Apply the Knowledge of semiconductor physics for designing the circuits of electronic devices.
CO-2	Obtain the characteristics of diode in forward and reverse bias and perform mathematical modeling of diode as a resistor and capacitor.
CO-3	Perform analysis and design of a complete AC to DC converter (Eg: Mobile Charger) consisting of Rectifiers, Filters and regulators.
CO-4	Describe the construction and working of a Transistor in various modes and design circuits for stabilization and compensation of both BJT and FET..
Course code: 17140306	
Course Title: Signals & Systems	

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CO-1	Identify different types of signal and systems properties that are commonly Used in engineering.
CO-2	Explain and differentiate the properties of continuous-time and discrete-time Linear Time Invariant (LTI) systems.
CO-3	Distinguish the Fourier series and transform in terms of applicable time functions and the resulting spectral properties
Course Outcomes for Second Year Second Semester Course	
Course code: 17140403	
Course Title: Electronic Circuits Analysis	
CO-1	Perform analysis and design of Small Signal High Frequency Transistor Amplifier models.
CO-2	Demonstrate the knowledge of multistage amplifier and differential amplifier using BJT.
CO-3	Analyze the concepts of both positive and negative feedback in electronic circuits and to generate signals in various frequency ranges
Course code: 17140404	
Course Name: EM Waves and Transmission Lines	
CO-1	Students are able to understand how EM waves will propagate in free space and their characteristics at the boundary between media.
CO-2	Students are familiar with the characteristics of transmission lines and their equivalent circuits at UHF.
CO-3	Students able to learn Maxwell's equations to understand boundary conditions of time varying fields.
Course code: 17140406	
Course Name: Analog Communication	
CO-1	Identify and describe different Amplitude modulation techniques
CO-2	Identify and applying Emphasis techniques in analog systems Sample analog signals
CO-3	Analyze different discrete pulse modulation techniques Understand and Simulate the different codes using MATLAB

Course Outcomes for Third Year First Semester Course	
Course Code:17145502	
Course Title: Computer Architecture & Organization	
CO-1	Know the concept of Basic operational concepts, computer arithmetic operations and Register Transfer language.
CO-2	Analyze the concept of central processing unit, micro programmed control and hard wired control.
CO-3	Analyze the concept of Memory management hardware, Input-Output Interface and Input-Output Processor.
Course Code: 17140505	
Course Title: Antenna and Wave Propagation	
CO-1	Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas, and micro-strip antennas.
CO-2	Analyze the fields radiated by various types of antennas.
CO-3	Analyze antenna arrays.
CO-4	Acquire knowledge of basic antenna parameters.
Course code: 17140506	
Course Title: Digital Communications	
CO-1	Analyze the performance of Digital communication system for probability of error and are able to design a digital communication system.

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CO-2	Analyze various source coding techniques.
CO-3	Compute and analyze block codes, cyclic codes and convolution codes.
Course Outcomes for Third Year Second Semester Course	
Course code: 17140602	
Course Title: Microprocessors and Microcontrollers	
CO-1	Understand architectural difference between Microprocessor and Microcontroller and its need for development of products and product development procedure.
CO-2	Apply concepts of programming in Assembly Language.
CO-3	Analyse concepts of Input/output port Interfacing of microcontroller.
Course code: 17140603	
Course Name: Digital Signal Processing	
CO-1	Estimate the spectra of signals that are to be processed by a discrete time filter, and to verify the performance of variety of modern and classical spectrum estimation techniques.
CO-2	Design and simulate a digital filter.
CO-3	Design new digital signal processing systems.
Course code: 17140701	
Course Name: VLSI	
CO-1	Apply the concept of design rules during the layout of a circuit.
CO-2	Model and simulate digital VLSI systems using Hardware Description Language.
CO-3	Synthesize digital VLSI systems from register transfer or higher level descriptions.

Course Outcomes for Fourth Year First Semester Course	
Course Code:17140702	
Course Title: Radar Systems	
CO-1	Acquire the knowledge to apply and design required parameters for RADAR system.
CO-2	Analyze the working principle of CW and Frequency Modulated Radar.
CO-3	Analyze the working principle of MTI and pulse Doppler Radar
Course Code: 17140704	
Course Title: Digital Image processing	
CO-1	Perform different transforms on image useful for image processing applications.
CO-2	Perform spatial and frequency domain filtering on image and can implement all smoothing and sharpening operations on images.
CO-3	Perform image restoration operation/techniques on images.
CO-4	Operate effectively on color images and different color conversions on images and can code images to achieve good compression.
Course code: 17140703	
Course Title: Optical Communication	
CO-1	Choose necessary components required in modern optical communication systems.
CO-2	Design and build optical fiber experiments in laboratory, and learn how to calculate electromagnetic modes in wave guides, the amount of light lost going through an optical system, dispersion of optical fibers.

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CO-3	Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems.
Course Outcomes for Fourth Year Second Semester Course	
Course code: 17140801	
Course Title: Cellular and Mobile Communications	
CO-1	Identify the limitations of conventional Mobile Telephone System and interpret the operation of cellular system.
CO-2	Illustrate the concept of frequency Reuse channels, Deduce the Co-channel interference reduction factor.
CO-3	Design the Antenna system to reduce Co-channel interference.
Course code: 17140862b	
Course Name: Mixed Signal Design	
CO-1	Demonstrate the concepts of Switched capacitor circuits.
CO-2	Apply the concept of Phased Locked Loop.
CO-3	Extend the Mixed Signal Design to Different Applications.
Course code: 17140862d	
Course Name: Real time Operating Systems	
CO-1	Summarize the issues in real time computing
CO-2	Understand how RTOS utilize resources like memory, CPU etc. effectively.
CO-3	Solve scheduling problems and can apply them in real time applications in industry

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GR-17 Electrical & Electronics Engineering

Department Vision:

To be a pioneering department in preparing students to compete globally in theirprofession and making significant contribution to the society.

Department Mission:

- Establishing centers of excellence with focus on advancedtechnology
- By preparing the students for successful careers based on a strong normalethical foundation
- Delivering world class teaching, mentoring, intellectual stimulation, industry collaborations and state of the art research
- By training and educating students as global citizens to become entrepreneursin their chosen field

Program Educational Objectives (PEOs):

PEO1	Engage in ongoing learning and professional development throughself- study, continuing education in Electrical and Electronics Engineering and also in other allied fields
PEO2	Apply their engineering skills, exhibiting critical thinking and problem solving skills in professional engineering practices or tackle social, technical and business challenges
PEO3	Improve professional competence through lifelong learning including higher education and research

Program Specific Outcomes (PSO's):

PSO1	Apply knowledge of power system configuration, electrical equipmentand protection practices to the design and specifications of electrical generation, transmission, distribution and utilization systems
PSO2	To design. Analyze, test and evaluate the performance of theelectrical machines and transformers
PSO3	To develop the expertise in the technology associated with efficient conversion and control of electrical power by static means fromavailable forms to the required form
PSO4	Graduates will able to work as research fellow and implement theirknowledge in all electrical and electronics research organization of defense, renewable energy, mines, chemical and power plants

Program Outcomes (POs): Engineering Graduates will beable to:

1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complexengineering problems.
2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

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4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, andmodern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledgeto assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate theknowledge of, and need for sustain able development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a memberor leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of theengineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinaryenvironments.
12	**Life-long learning:** Recognize the need for, and have the preparation and abilityto engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes for First Year First SemesterCourse	
Course Code: 17199102	
Course Title: Mathematics-I	
CO-1	Solve first and higher order ordinary differential equations (ODE) with applicationsby various techniques
CO-2	Apply Laplace Transforms to solve Initial Value Problems and evaluate InfiniteIntegrals
CO-3	Apply Partial Differentiation to solve Inequalities and to find maxima and minima
CO-4	Solve first and higher order PDE with their applications to Heat equation, waveequation, Laplace equation
Course Code: 17199101	
Course Title: English-I	
CO-1	Take inspiration by reading autobiographies
CO-2	Aspire for the useful innovations to improve living
CO-3	Help the common man and achieve the social cause
CO-4	Achieve the target without compromise
Course Code: 17199104	
Course Title: Engineering Mechanics	
CO-1	Summaries the behavior of basic materials under the influence of different external loading conditions and support conditions.
CO-2	Determine shear Force and Bending moments in statically determinate Beams and drawthe Diagrams.

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CO-3	Examine the different methods to find slope and deflection of beams subjected to loads
CO-4	Estimate the principal stresses & strains and torsional stresses in structural members
Course Code: 17199196	
Course Title: Professional Ethics & Human Values	
CO-1	Understood the core values that shape the ethical behavior of an engineer
CO-2	Exposed awareness on professional ethics and human values
CO-3	Known their role in technological development
CO-4	knowledge of contemporary issues related to human and professional Interactions atworkplace which helps students to understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature
Course Code: 17199103	
Course Title: Computer Programming	
CO-1	Obtain the knowledge about different languages used in computer programming
CO-2	Write algorithm. Flow chart, and structure of C program and make use of different C tokens
CO-3	Develop program by using control structure , different looping and Jump statements
CO-4	Implement applications of Array, structure and String inside the program
Course Code: 17199189	
Course Title: Engineering Workshop & IT Workshop	
CO-1	Explain the limitations, tolerances, safety aspects of electrical systems & wiring.
CO-2	Select wires/cables and other accessories used in different types of wiring
CO-3	Make simple lighting and power circuits
CO-4	Make disassembling and assembling of PC.
Course Code: 14199111	
Course Title: English Communication Lab I	
CO-1	Learn to communicate in English
CO-2	Comprehend native speaker's accent
CO-3	Speak appropriately in real life situations
CO-4	Display public speaking skills in the required context
Course Code: 17199112	
Course Title: Computer Programming Lab	
CO-1	Obtain the knowledge about different languages used in computer programming
CO-2	Write algorithm. Flow chart, and structure of C program and make use of different C tokens
CO-3	Develop program by using control structure , different looping and Jump statements
CO-4	Implement applications of Array, structure and String inside the program
Course Code : 17199105	
Course Title : Mathematics-II	
CO-1	Apply numerical techniques to solve algebraic and transcendental equations and also initial value problems and ODE
CO-2	To interpolate the tabulated data at the given values using various interpolation techniques
CO-3	Express a given function satisfying certain conditions in Fourier series
CO-4	Use finite and infinite Fourier Integral Transforms to solve BVPs
Course Outcomes for First Year Second Semester Course	
Course Code : 17199203	
Course Title : Engineering Drawing	
CO-1	Apply principles of drawing to represent dimensions of an object

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CO-2	Outline the Polygons and engineering curves
CO-3	Illustrate projections of points, lines, plane and solids
CO-4	Illustrate 3D views through isometric views
Course Code: 17199204	
Course Title: Engineering Physics	
CO-1	Understand applications of optics using basic fundamentals of Physics
CO-2	Explain the Modern Physics Concepts
CO-3	Familiar with Basic Elements of Quantum Theory
CO-4	Knowledge about dual nature of wave function, Applications of Schrodinger waveequation Fermi-Dirac probability function
Course Code: 17199201	
Course Title: English-II	
CO-1	Be inspired by Bose's achievements so that he may start his own original work
CO-2	Be inspired by Bhabha's achievements so as to make his own experiments
CO-3	Realize that development is impossible without scientific research
CO-4	Appreciate the art of writing a short story and try his hand at it.
Course Code: 17199202	
Course Title: Engineering Chemistry	
CO-1	Understand the removal technique of hardness of the water
CO-2	Distinguish the fuel cells and batteries
CO-3	Identify different control techniques of corrosion
CO-4	Understand the concept of plastics and rubbers
Course code : 14199212	

Course Title: Engineering Physics Laboratory	
CO-1	To handle optical instruments like microscope and spectrometer
CO-2	To demonstrate the importance of dielectric material in storage of electric field energyin capacitors
CO-3	To evaluate the resistivity of the given semiconductor using probe method
CO-4	To identify the type of semi-conductor
Course Code: 17199206	
Course Title: Environmental Studies	
CO-1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems
CO-2	Comprehend environmental problems from multiple perspectives with emphasis on human modern life styles and developmental activities
CO-3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of 21st century
CO-4	Recognize the interconnectedness of human dependence on the earth's eco system
Course Code: 17199211	
Course Title: English Communicative Laboratory II	
CO-1	Learn to communicate in English
CO-2	Comprehend native speaker's accent
CO-3	Speak appropriately in real life situations
CO-4	Display public speaking skills in the required context
Course Code : 17199205	
Course Title : Data Structures Through C	
CO-1	Obtain the knowledge about different languages used in computer programming
CO-2	Write algorithm. Flow chart, and structure of C program and make use of different C tokens

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CO-3	Develop program by using control structure , different looping and Jump statements
CO-4	Implement applications of Array, structure and String inside the program
Course Code : 17199213	
Course Title : Data Structures Through C Lab	
CO-1	Obtain the knowledge about different languages used in computer programming
CO-2	Write algorithm. Flow chart, and structure of C program and make use of different C tokens
CO-3	Develop program by using control structure , different looping and Jump statements
CO-4	Implement applications of Array, structure and String inside the program
Course Outcomes for Second Year First Semester Course	
Course Code : 17120303	
Course Title : Electrical Circuits Analysis – I	
CO-1	Analyze electrical network in presence of active and passive elements
CO-2	Analyze magnetic circuit with various dot convention
CO-3	Analyze steady state circuits
CO-4	Analyze series and parallel resonant circuit
Course Code : 17120304	
Course Title : Electro Magnetic Fields	
CO-1	Analyze field potentials due to static changes and static magnetic fields
CO-2	Explain how materials affect electric and magnetic fields
CO-3	Analyze the relation between the fields under time varying situations.
CO-4	Discuss the principles of propagation of uniform plane waves.
Course Code : 17120305	
Course Title : Electrical Machines – I	
CO-1	Analyze the conditions required of self excitation of dc generators and paralleloperation of dc generators the operation of dc machines
CO-2	Determine the performance of dc machine using the results of tests
CO-3	Distinguish the operation of various dc machine configurations.
CO-4	Determine the voltage regulation and efficiency of single phase transformer.
Course Code : 17129304	
Course Title : Mathematics III	
CO-1	Familiarize with the techniques in partial differential equations and complex variables
CO-2	Solve application problems
CO-3	Familiarize the transform techniques and complex variables
Course Code : 17123301	
Course Title : Fluid Mechanics & Hydraulic Machinery	
CO-1	Define fundamental concepts of fluid mechanics as applied to civil engineering and environmental problems
CO-2	Discuss and derive the fundamental mathematical equations of fluid mechanics
CO-3	Solve the problems of water conveyance in pipes, orifices, mouthpieces, notches and weirs
CO-4	Apply conservation laws to derive governing equations of fluid flows
Course Code : 17124302	
Course Title : Electronic Devices & circuits	
CO-1	Understand the basic concepts of semiconductor physics
CO-2	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

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CO-3	Know the construction, working principle of rectifiers with and without filters withrelevant expressions and necessary comparisons
CO-4	Understand the construction, principle of operation of transistors, BJT and FET withtheir V-I characteristics in different configuration
Course Code : 17129397	
Course Title : Soft Skills – I	
CO-1	Construct coherent, cohesive and unambiguous verbal expressions in both oralAnd written discourses.
CO-2	Analyze the given data/text and find out the correct responses to the questionsasked based on there aiding exercises; identify relationships or patterns within groups of words or sentences
CO-3	Write paragraphs on a particular topic, essays (issues and arguments), e mails,summaries of group discussions, reports, make notes, statement of purpose(for Admission into foreign universities), letters of recommendation(for professional andeducational purposes).
CO-4	Converse with ease during interactive sessions/seminars in their classrooms, competeinliterary activities like elocution, debates etc., raise doubts in class, participate in JAM sessions/versant tests with confidence and convey oral information in aprofessional manner.
Course Code : 17124311	
Course Title : Electronic Devices & Circuits Lab	
CO-1	Analyze the characteristics of diodes, transistors and other devices
CO-2	Design and implement the rectifier circuits, SCR and UJT in the hardware circuits
CO-3	Design the biasing and amplifiers of BJT and FET amplifiers
CO-4	Measure electrical quantities using CRO in the experimentation
Course Code : 17123312	
Course Title : Fluid Mechanics & Hydraulic Machines Lab	
CO-1	Define and Measure Fluid Properties.
CO-2	Illustrate Flow Measuring Devices used in pipes, channels and Tanks
CO-3	Analyze characteristics of broad crested weir.
CO-4	Illustrate the characteristics of surface profiles in free and forced vibrations.
Course Outcomes for Second Year Second Semester Course	
Course Code : 17120403	
Course Title : Electrical Circuit analysis – II	
CO-1	Able to solve three- phase circuits under balanced and unbalanced condition
CO-2	Learn transient response of electrical networks for different types of excitations.
CO-3	To find parameters for different types of network.
CO-4	To realize electrical equivalent network for a given network transfer function.

Course Code : 17120404	
Course Title : Power Systems – I	
CO-1	Understand the Principle of operation of different types of conventional powergenerating stations.
CO-2	Classify Distribution system and its design
CO-3	Classify Substations
CO-4	Types of Underground cables
Course Code : 17120405	
Course Title : Electrical Machines – II	
CO-1	Demonstrate ability to understand operation and working of 3-Ph induction motor

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CO-2	Analyze performance alternator when connected in parallel with infinite bus or withanother alternator
CO-3	Determine the voltage regulation of alternator through indirect methods and paralleloperation of alternators
CO-4	Demonstrate ability to understand the concepts of synchronous motor's working andmethods to start synchronous motor.
Course Code : 17120406	
Course Title : Electrical Measurements	
CO-1	Know principles of different electrical measurement instruments and to measurevoltage and current and different types of instruments for measurement of Power and Energy.
CO-2	Understand about different types of A.C and D. C Potentiometers
CO-3	Measure resistance, capacitance, inductance and frequency by using various bridges
CO-4	Know about the magnetic measurements
Course Code : 17120401	
Course Title : Switching Theory and Logic Design	
CO-1	Analyze different number systems, its conversions
CO-2	Analyze different types of logic gates and fundamentals of karnaugh maps
CO-3	Understand the design of combinational and sequential circuits using logic gates
CO-4	Understand the fundamentals of op-amps, its circuits and parameters
Course Code : 17124402	
Course Title : Pulse & Digital Circuits	
CO-1	Analyze different number systems, its conversions
CO-2	Analyze different types of logic gates and fundamentals of karnaugh maps
CO-3	Understand the design of combinational and sequential circuits using logic gates
CO-4	Understand the fundamentals of op-amps, its circuits and parameters
Course Code : 17120411	
Course Title : Electrical Machines – I Lab	
CO-1	Determine the performance of DC shunt machine
CO-2	Determine the performance of DC series machine
CO-3	Determine the performance of DC compound machine
CO-4	Connect DC machines in parallel
Course Code : 17120412	
Course Title : Electrical Circuits Lab	
CO-1	Apply mesh and nodal analysis to solve electrical circuit problems
CO-2	Analyze circuits in the sinusoidal steady-state domain
CO-3	Apply network theorems for the analysis of circuits and two port networks
CO-4	Measure active and reactive powers

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GR-17 MECHANICAL ENGINEERING

Department Vision:

To be recognized as a Global Centre of Excellence in Mechanical Engineering Education, Research and Consultancy

Department Mission:

Department of Mechanical Engineering strives to provide scope for all round development of the students and staff by engaging them in various activities such as

- Participative learning so that students internalize their classroom learning practices.
- Student centric learning practices such as summary sessions, learn-ahead-of class, problem solving.
- Extensive practical courses to foster learning by observation.
- Exposing students, faculty and staff to various industrial practices and usage of modern tools to reinforce their classroom/laboratory learning.
- Sensitization towards importance of ethical practice, societal responsibility, leadership skills, entrepreneurship skills, communication skills and lifelong learning.

Program Educational Objectives (PEOs):

PEO1	Working professional in Mechanical Engineering field or other disciplines to develop products, processes to solve Mechanical Engineering related or other problems for betterment of society.
PEO2	Pursuing further education to enrich their knowledge in Mechanical Engineering or other fields.
PEO3	Undertaking entrepreneurial ventures in Mechanical Engineering or other disciplines.

Program Specific Outcomes (PSO's):

PSO1	Join a technically sophisticated workforce as successful professionals in a wide range of mechanical engineering and related fields.
PSO2	Continuously improve and expand their technical and professional skills through formal means as well as through informal self-study.
PSO3	Pursue advanced degrees in engineering, business, or other professional fields.
PSO4	Advance themselves professionally and personally by accepting professional and social responsibilities and pursuing leadership roles.

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Program Outcomes (POs): Engineering Graduates will be able to:

1	Apply fundamental knowledge of Science, Mathematics and Engineering principles in solving problems related to Mechanical Engineering.
2	Apply principles of design engineering, thermal engineering, production engineering and industrial engineering to arrive at a physically meaningful analysis of engineering problems.
3	Present feasible designs for simple domestic and industrial Mechanical Engineering problems through drawings and other multimedia tools to meet desired needs.
4	Identify, formulate and solve Mechanical engineering problems through rigorous research methodology.
5	Use Drafting, Modeling and Analysis Software and/or hardware tools for meaningful and economically viable Engineering practice.
6	Apply knowledge of Thermal, Design, Automation Technologies and Management principles to inter-disciplinary engineering problems and their societal implications.
7	Understand and propose, where ever possible, environment-friendly and sustainable solutions to Mechanical Engineering problems.
8	Expertise in following ethical code of conduct in professional activities.
9	Use their analytical, teamwork, leadership skills in the development of products and provide solutions to problems sought by local and/or global community.
10	Communicate verbally, textually and graphically to collaborate effectively towards engineering activities
11	Inspire confidence in team members to realize the goals of the organization and manage finances an sizeable projects by choosing the right blend of common sense solutions.
12	Develop confidence and a sense of curiosity towards life-long learning to adapt to ever changing technologies.

Course outcomes for First Year First Semester Course	
Course Code: 17198102	
Course Title: Mathematics - I	
CO1:	Transform the knowledge of solving system of linear equations using matrices.
CO2:	Evaluate nature of the Quadratic form.
CO3:	Acquire the knowledge maxima and minima of function of several variables.
CO4:	Evaluate multiple integrals and their applications.
CO5:	Understand and apply vector derivatives and vector integration theorems.
Course Code: 17198101	
Course Title: Communicative English-I	
CO1:	Develop effective reading strategies
CO2:	Demonstrate writing skills that are required for professional development and use graphic elements for communication.
CO3:	Apply grammatical skills and vocabulary effectively in speech and writing
CO4:	Display language efficacy in tune with subjective knowledge
CO5:	Use required language along with contextual vocabulary and grammar structures

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Course Code: 17198205	
Course Title: Engineering Chemistry	
CO1:	Understand the removal techniques of hardness of water
CO2:	Distinguish the fuel cells and batteries
CO3:	Identify different control techniques of corrosion
CO4:	Understand the concepts of plastics and rubbers
CO5:	Analyse the importance of nanomaterials.
Course Code : 17132302	
Course Title: Basic Electrical and Electronics Engineering	
CO1:	Analyze the various electrical networks.
CO2:	Perform the operation of DC generators,3-point starter and conduct the Swinbume's Test.
CO3:	Analyze the performance of transformer, operation of 3-phase alternator and 3-phase Induction motors.
CO4:	CO-4. Analyze the operation of half Wave, full wave rectifiers, op-amps and explain the single stage CE amplifier and concept of feedback amplifier.
Course Code: 17193176	
Course Title: Engineering Graphics	
CO1:	To understand the concepts and use of drawing Instruments and Curves used in Engineering Practice.
CO2:	To understand the concepts of Vernier and Diagonal scales and concepts of orthographic projections.
CO3:	To understand the concepts of Projections of isometric views to orthographic views.
Course Code: 17198212	
Course Title: Engineering Chemistry Laboratory	
CO1:	Explain the functioning of the instruments such as pH, conductivity, and potentiometric meters.
CO2:	Determine the total hardness of water
CO3:	Perform various redox titrations.
CO4:	Preparation of polymers
CO5:	Compare viscosities of different oils
Course outcomes for First Year Second Semester Course	
Course Code: 17198202	
Course Title: Mathematics – II	
CO1:	Solve first order differential equations.
CO2:	Solve higher order differential equations with constant coefficients
CO3:	Apply the knowledge of approximating and find the roots of polynomial and transcendental equation in practical engineering problems.
CO4:	Understand numerical differentiation and integration.
CO5:	Apply the knowledge of different algorithms for approximating the solution of ordinary differential equations in practical engineering problems.
Course Code: 17198104	
Course Title: Engineering Physics	
CO1:	Construction and working details of instruments
CO2:	Interferometer, Diffract meter and Polarimeter are learnt.
CO3:	Study EM-fields and semiconductors under the concepts of Quantum mechanics paves way for their optimal utility.

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Course Code: 17193204	
Course Title: Engineering Mechanics	
CO1:	To understand the concepts of forces and its resolution in different planes.
CO2:	To understand the concepts of Equilibrium of Systems of Forces, law of Triangle of forces and converse of the law of polygon of forces.
CO3:	To understand the concepts of Area moments of Inertia, Mass Moment of Inertia.
CO4:	To understand the concepts of Equations for Translation, D'Alembert's principle in rotation.
Course Code: 17195103	
Course Title: Computer Programming	
CO1:	Obtain the knowledge about different languages used in computer programming and also about the number systems which will be very useful for bitwise operations and basic terminology used in the computer programming.
CO2:	Obtain knowledge about algorithm, flow chart, and structure of C program and different C tokens used inside C program and develop program by using Control structure, different looping and Jump statement.
CO3:	Obtain knowledge about the application and implementation of 2-dimentional Array and string inside the program.
CO4:	Obtain knowledge about different functionalities of Preprocessors and also to develop the program by using different type of function calls.
Course Code: 17130303	
Course Title: Material Science and Metallurgy	
CO1:	To enhance students' ability to understand the science and fundamentals of materials
CO2:	To understand the basic requirements and improve the selection and utilization of materials
CO3:	To understand the regions of stability of phases that occur in the systems
Course Code: 17198112	
Course Title: Engineering Physics Laboratory	
CO1:	Physics lab curriculum gives fundamental understanding of design of an instrument with targeted accuracy for physical measurements
Course Code: 17198111	
Course Title: Communicative English Laboratory	
CO1:	Learn to communicate in English
CO2:	Comprehend native speaker's accent
CO3:	Speak appropriately in real life situations
CO4:	Display public speaking skills in the required context
CO5:	Handle different communicative situations
Course Code: 17195113	
Course Title: Computer Programming Laboratory	
CO1:	To know the structure and syntax of a programming language.
CO2:	To develop code for simple mathematical problems.
CO3:	To write the programs using arrays, structures and pointers
Course Code: 17198105	
Course Title: Environmental Studies	
CO1:	The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
CO2:	The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food webs.

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CO3:	The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity

Course Outcomes for Second Year First Semester Course	
Course Code: 17130304	
Course Title: Mechanics of Solids	
CO-1	Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials.
CO-2	Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings.
CO-3	Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural.
CO-4	Calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels.
CO-5	Able to calculate the failure load of column and struts with different type of end condition.
Course Code:17130403	
Course Title: Production Technology	
CO-1	Understand principles of sand casting processes.
CO-2	Discuss various casting methods and melting methods.
CO-3	Demonstrate welding methods and their applications.
CO-4	Explain metal forming methods such as rolling, forging, extrusion and sheet metal forming methods.
CO-5	Interpret the methods of fabrication of different plastics.
Course Code: 17130305	
Course Title: Thermodynamics	
CO-1	Explain the importance of thermodynamic properties related to conversion of heat energy into work.
CO-2	Apply the laws of thermodynamics to boilers, heat pumps, refrigerators, IC engines, compressors and nozzles.
CO-3	Utilize steam properties in components of heat engines running with steam.
CO-4	Compare air standard cycles using thermodynamic relations.
CO-5	Apply thermodynamics in solving engineering problems relates heat and work
Course Code: 17130404	
Course Title: Fluid Mechanics & Hydraulic Machinery	
CO-1	Discuss the properties of fluids, pressure and its measurement.
CO-2	Identify the types lines, flows and derive continuity equation, Bernoulli's equation and Buckingham's π theorem.
CO-3	Examine the energy losses in pipes and sketch EGL. Discuss about the flow measuring devices. Learn the concepts of boundary layer.
CO-4	Describe working of hydraulic turbines and performance characteristics.
CO-5	Describe working centrifugal and reciprocating pumps and its performance.
Course Code: 17130411	
Course Title: Fluid Mechanics & Hydraulic Machinery Lab	
CO-1	Understand the concept of flow measuring devices and determine the coefficient of discharge of Venturimeter and Orifice meter
CO-2	Apply the knowledge of Centrifugal pump and Reciprocating pump in real life situations and find out the performance of pumps.
CO-3	Evaluate the performance parameters of hydraulic turbines Pelton wheel and Francis turbine.

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CO-4	Understand the concept of flow through pipes and determine the losses.
CO-5	Justify the Bernoulli's theorem
Course Code: 17130312	
Course Title: Mechanics of Solids & Metallurgy lab	
CO-1	Determine the Young's Modulus for ductile materials and analyze the various points on stress strain diagram.
CO-2	Analyze& compare the hardness values for various materials.
CO-3	Understand various micro structures and relationship to properties.
CO-4	Compare the Micro structures of Ferrous & Non-Ferrous Alloys.
CO-5	Improving material properties by different heat treatment processes.
Course Code: 17130376	
Course Title: Computer Aided Design and Modelling Lab	
CO-1	Illustrate the importance of CAD package and its basic commands.
CO-2	Produce the orthographic projections of regular solids.
CO-3	Develop the lateral surfaces of regular solids and interpenetration curves
CO-4	Convert to Isometric drawings and 3D Surface Models.
CO-5	Connect simple parts using CAD Package
Course Outcomes for Second Year Second Semester Course	
Course Code: 17130401	
Course Title: Kinematics of Machinery	
CO-1	Explain about the mobility and inversions of a planar mechanism.
CO-2	Discuss mechanisms with lower pairs
CO-3	Determine the velocity and acceleration for the planar mechanisms
CO-4	Analyse the motion of the cams and followers.
CO-5	Analyse Gears and Gear Trains
Course Code: 17130402	
Course Title: Thermal Engineering	
CO-1	Evaluate performance of IC Engine.
CO-2	Evaluate various efficiencies of air compressors.
CO-3	Define various types of boilers and principles of draught.
CO-4	Classify different types of Nozzle and Condensers.
CO-5	Analyze the thermal analysis of steam turbines.
Course Code: 17130405	
Course Title: Industrial Engineering & Management	
CO-1	Describe the various concepts of management techniques.
CO-2	Identify a suitable plant location and layout by considering various industrial aspects.
CO-3	Use work study concepts to improve productivity.
CO-4	Apply the suitable quality management techniques.
CO-5	Assess the project duration and crashing of any network problems.
Course Code: 17130412	
Course Title: Production Technology Lab	
CO-1	Understand the fundamentals of pattern making, molding process./understand the pattern design and making using wood turning lathe.

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CO-2	Gain knowledge in sand casting processes.
CO-3	Learn on Welding processes like MMAW. Gas welding and cutting , TIG , MIG welding and resistance process.
CO-4	Gain knowledge on sheet metal cutting and operations, extrusion.
CO-5	Understand the fabrication methods of plastics using injection and blow moulding.
Course Code: 17130413	
Course Title: Thermal Engineering Lab	
CO-1	Calculate various powers, efficiencies and energy balance for several types of Internal Combustion Engines and compressors.
CO-2	Classify various types of IC Engines, Air compressors & cycle of operations
CO-3	Demonstrate the effect of various operating variables on engine performance
CO-4	Estimate properties of various fuels and lubricants.
CO-5	Evaluate Coefficient of Performance of Refrigeration and Air-conditioning units
Course Code: 17130376	
Course Title: Computer Aided Machine Drawing	
CO-1	Illustrate the conventional representations of materials and machine components.
CO-2	Produce the detachable joints by any CAD package.
CO-3	Sketch 2D profile of riveted, welded and key joints.
CO-4	Develop the shaft couplings solid model in 3D CAD package.
CO-5	Connect the Engine parts, machine tool parts , valves and Miscellaneous parts to form assemblies.

Course Outcomes for Second Year First Semester Course	
Course Code: 17130304	
Course Title: Mechanics of Solids	
CO-1	Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials.
CO-2	Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings.
CO-3	Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural.
CO-4	Calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels.
CO-5	Able to calculate the failure load of column and struts with different type of end condition.
Course Code:17130403	
Course Title: Production Technology	
CO-1	Understand principles of sand casting processes.
CO-2	Discuss various casting methods and melting methods.
CO-3	Demonstrate welding methods and their applications.
CO-4	Explain metal forming methods such as rolling, forging, extrusion and sheet metal forming methods.
CO-5	Interpret the methods of fabrication of different plastics.
Course Code: 17130305	
Course Title: Thermodynamics	
CO-1	Explain the importance of thermodynamic properties related to conversion of heat energy into work.
CO-2	Apply the laws of thermodynamics to boilers, heat pumps, refrigerators, IC engines, compressors and nozzles.
CO-3	Utilize steam properties in components of heat engines running with steam.

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CO-4	Compare air standard cycles using thermodynamic relations.
CO-5	Apply thermodynamics in solving engineering problems relates heat and work
Course Code: 17130404	
Course Title: Fluid Mechanics & Hydraulic Machinery	
CO-1	Discuss the properties of fluids, pressure and its measurement.
CO-2	Identify the types lines, flows and derive continuity equation, Bernoulli's equation and Buckingham's π theorem.
CO-3	Examine the energy losses in pipes and sketch EGL. Discuss about the flow measuring devices. Learn the concepts of boundary layer.
CO-4	Describe working of hydraulic turbines and performance characteristics.
CO-5	Describe working centrifugal and reciprocating pumps and its performance.
Course Code: 17130411	
Course Title: Fluid Mechanics & Hydraulic Machinery Lab	
CO-1	Understand the concept of flow measuring devices and determine the coefficient of discharge of Venturimeter and Orifice meter
CO-2	Apply the knowledge of Centrifugal pump and Reciprocating pump in real life situations and find out the performance of pumps.
CO-3	Evaluate the performance parameters of hydraulic turbines Pelton wheel and Francis turbine.
CO-4	Understand the concept of flow through pipes and determine the losses.
CO-5	Justify the Bernoulli's theorem
Course Code: 17130312	
Course Title: Mechanics of Solids & Metallurgy lab	
CO-1	Determine the Young's Modulus for ductile materials and analyze the various points on stress strain diagram.
CO-2	Analyze& compare the hardness values for various materials.
CO-3	Understand various micro structures and relationship to properties.
CO-4	Compare the Micro structures of Ferrous & Non-Ferrous Alloys.
CO-5	Improving material properties by different heat treatment processes.
Course Code: 17130376	
Course Title: Computer Aided Design and Modelling Lab	
CO-1	Illustrate the importance of CAD package and its basic commands.
CO-2	Produce the orthographic projections of regular solids.
CO-3	Develop the lateral surfaces of regular solids and interpenetration curves
CO-4	Convert to Isometric drawings and 3D Surface Models.
CO-5	Connect simple parts using CAD Package
Course Outcomes for Second Year Second Semester Course	
Course Code: 17130401	
Course Title: Kinematics of Machinery	
CO-1	Explain about the mobility and inversions of a planar mechanism.
CO-2	Discuss mechanisms with lower pairs
CO-3	Determine the velocity and acceleration for the planar mechanisms

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CO-4	Analyse the motion of the cams and followers.
CO-5	Analyse Gears and Gear Trains
Course Code: 17130402	
Course Title: Thermal Engineering	
CO-1	Evaluate performance of IC Engine.
CO-2	Evaluate various efficiencies of air compressors.
CO-3	Define various types of boilers and principles of draught.
CO-4	Classify different types of Nozzle and Condensers.
CO-5	Analyze the thermal analysis of steam turbines.
Course Code: 17130405	
Course Title: Industrial Engineering & Management	
CO-1	Describe the various concepts of management techniques.
CO-2	Identify a suitable plant location and layout by considering various industrial aspects.
CO-3	Use work study concepts to improve productivity.
CO-4	Apply the suitable quality management techniques.
CO-5	Assess the project duration and crashing of any network problems.
Course Code: 17130412	
Course Title: Production Technology Lab	
CO-1	Understand the fundamentals of pattern making, molding process./understand the pattern design and making using wood turning lathe.
CO-2	Gain knowledge in sand casting processes.
CO-3	Learn on Welding processes like MMAW. Gas welding and cutting , TIG , MIG welding and resistance process.
CO-4	Gain knowledge on sheet metal cutting and operations, extrusion.
CO-5	Understand the fabrication methods of plastics using injection and blow moulding.
Course Code: 17130413	
Course Title: Thermal Engineering Lab	
CO-1	Calculate various powers, efficiencies and energy balance for several types of Internal Combustion Engines and compressors.
CO-2	Classify various types of IC Engines, Air compressors & cycle of operations
CO-3	Demonstrate the effect of various operating variables on engine performance
CO-4	Estimate properties of various fuels and lubricants.
CO-5	Evaluate Coefficient of Performance of Refrigeration and Air-conditioning units
Course Code: 17130376	
Course Title: Computer Aided Machine Drawing	
CO-1	Illustrate the conventional representations of materials and machine components.
CO-2	Produce the detachable joints by any CAD package.
CO-3	Sketch 2D profile of riveted, welded and key joints.
CO-4	Develop the shaft couplings solid model in 3D CAD package.
CO-5	Connect the Engine parts, machine tool parts , valves and Miscellaneous parts to form assemblies.

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GR- 17 Master of Business Administration

Department Vision:

To be a centre of excellence for management education and nurture young minds into professionals with values, passion, integrity and entrepreneurial spirit.

Department Mission:

- Offer enriching learning experience.
- Provide cutting edge paradigms to the aspiring Managers.
- Highlight the contemporary Management practices and enlighten the budding Managers.
- Adopt Innovative Approach in introducing business world to the students.
- Influence the students with uncompromising Human Values so as to make them as ideal Corporate Citizens.

Program Educational Objectives (PEOs):

PEO1	Engage in ongoing learning and professional development through self- study, continuing education in Electrical and Electronics Engineering and also in other allied fields
PEO2	Apply their engineering skills, exhibiting critical thinking and problem solving skills in profession all engineering practices or tackle social, technical and business challenges
PEO3	Improve professional competence through lifelong learning including higher education and research

Program Specific Outcomes (PSO's):

PSO1	Demonstrating professionalism, self-awareness, leadership and effective communication skills
PSO2	Possessing the skills requiring to work and lead effectively in a team based environment
PSO3	Integrating tools and concepts from multiple functional areas (i.e., Finance, HR, Marketing, Operations etc.,) to solve business problems
PSO4	Understanding concepts of Information Technology (IT) and how IT can improve organizational performance. Identifying key issues facing a business or business sub-division
PSO5	Utilizing qualitative and quantitative methods to investigate and solve critical business problems.
PSO6	Evaluating and integrating ethical considerations when making business decisions.
PSO7	Incorporating diversity and multicultural perspectives while making business decisions.

Program Outcomes (POs): MBA Graduates will be able to:

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1	To develop ideas and ideologies to inspire and impress the business world with effective personality and communication skills.
2	To be proactive to critical situations and changes of business management.
3	To be responsive for the difficulties of the society with possible solutions.
4	To sustain in competition with optimal performance.
5	To practice knowledge management for potential enrichment.
6	To make continuous improvement and practice Kaizen.
7	To execute feasibility study for effective decision making.
8	To contribute to business consultancy.
9	To be a Professional with care for, concern and consistency in performance.
10	To be trust worthy

Course outcomes for First Year First Semester Course	
Course Code: : 17400101	
Course Title: Management Theory and Practices	
CO1:	To provide a rich pool of contemporary Management knowledge.
CO2:	To gain the knowledge in time tested principles, basic concepts, emerging ideas, evolving theories, and latest techniques.
CO3:	To understand the ever changing procedures & practices in the field of Management in a comprehensive way
CO4:	Students can gain the knowledge of contemporary issues like MBO, SIX SIGMA, TQM etc.,
CO5:	To enable the students to understand critical decisions that ensure growth and sustainability of the organization.
Course Code: 17400102	
Course title: Managerial Economics	
CO1:	Enable students to get the basic economic principles, forecast demand and supply and
CO2:	Should be able to estimate cost and understand market structure and pricing practices
CO3:	To gain knowledge in Pricing methods, market structures and various Concepts.
CO4:	The module draws on student prior learning and combines insights from economics.
CO5:	Finding solutions to various problems that arise in ordinary business life
Course Code: 17400103	
Course Title: Accounting For Managers	
CO 1:	Student shall be able to apply accounting concepts, principles, standards and processes
CO 2:	Student must demonstrate analytical skills through findings, organizing, assessing and analyzing data appropriate to a given situation.
CO 3:	Student must demonstrate skills in financial analysis.
CO 4:	Each student must identify and analyze financial statements.
Course Code: 17400104	
Course Title: Managerial Communication & Soft Skills and Business Etiquette	
CO1:	To develop communication skills.
CO2:	To gain Knowledge of intra personal and inter personal communication skills.
CO3:	To demonstrate the knowledge of formal and informal report writing

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CO4:	Apply the knowledge of problem solving
CO5:	Gain knowledge of communicating through social media and mobile
Course Code: 17400105	
Course Title: Business Environment	
CO1:	To provide a rich pool of contemporary knowledge.
CO2:	To gain the knowledge in time tested principles, basic concepts, emerging ideas, evolving theories, and latest techniques .
CO3:	To understand the ever changing procedures & practices in the field of law in a comprehensive way.
CO4:	Students can gain the knowledge on balance of payments.
CO5:	Competition Act and BIFR and enable them to understand critical decisions that ensure growth and sustainability of the organization .
Course Code:17400106	
Course Title: Quantitative Analysis For Business Decisions	
CO1:	Acquits with data reduction techniques and calculate and interpret measures of central values and dispersion.
CO2:	Understands and applies decision making in business and marketing.
CO3:	Performs optimization techniques like linear programming.
CO4:	Aware of application techniques in transportation assignment and replacement problem.
CO5:	Can draw Network diagram for project and draw conclusion from it.
Course Code: 174005	
CO1:	To know the process of assembling a personal computer, installation of system software
CO2:	Like MS Windows, Linux and the required device drivers.
CO3:	Understand the hardware and software level trouble shooting process, tips and tricks.
CO4:	Masters in working PC to disassemble and assemble to working condition and install
Course outcomes for First Year Second Semester Course	
Course Code: 17400201	
Course Title :Financial Management	
C01:	Understand the basic type of financial management decisions and the role of the financial manager.
C02:	Identify tools used by Finance professionals in making financial decisions.
C03:	Explain how the manager's decisions are reflected in the share prices.
C04:	Specify the objective hat ensure Financial Managers makes rational investment and how they make short term investment decisions.
C05:	Examine the implications of stakeholders, ethics and the agency relationships
Course Code: 17400202	
Course Title :Human Resource Management	
CO1:	Analyze the broad fundamental concepts of HRM.
CO2:	Assess the processes to build a talented work force (include recruitment and selection, training and development, professional development plans).
CO3:	Evaluate performance and mange effectively in unionized environment.
CO4:	Use the qualitative and quantitative information to make effective decisions related to functional areas of business.
CO5:	Mange group and individual dynamics in organization.
Course Code: 17400203	
Course Title : Marketing Management	

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CO1:	By reading text and relating the concepts through cases the student would be able to understand the concepts of marketing management.
CO2:	They will be able to analyze markets and design customer driven strategies and will be able to communicate the decisions towards business development with customer relation as focus.
Course Code: 17400204	
Course Title: 111- IT-LAB	
CO1:	Students will identify operational and administrative processes and roles and responsibilities of operation managers in different organizational contexts.
CO2:	Students can analyze the content of an operations strategy and the decision involved.
CO3:	Understand the input – process-output framework ,the extensions of it and apply them to a wide range of operations.
CO4:	Students can gain the knowledge of forecasting techniques in operations and productions methods.
Course Code: 17400205	
Course Title : Business Research Methods	
CO1 :	Theoretical and Applied Research
CO2:	Knowing Data collection Methods
CO3:	Questionnaire Preparation
CO4:	Preparation of Quality Control Charts
CO5:	Gain Knowledge in Research Techniques
Course Code: 17400206	
Course Title : Organizational Behavior	
CO1:	Analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organizational behavior.
CO2:	Assess the potential effects of organizational-level factors (such as structure, culture and change) on organizational behavior.
CO3:	Critically evaluate the potential effects of important developments in the external environment (such as globalization and advances in technology) on organizational behavior.
CO4:	Analyze organizational behavioral issues in the context of organizational behavior theories, models and concepts
Course outcomes for II Year I Semester Course	
Course Code: 17400301	
Course Title : -Strategic Management	
CO1:	Overview of strategic management.
CO2:	Knowledge of environmental analysis and framing of strategy .
CO3:	Demonstrate the knowledge of leadership styles and planning of strategy.
CO4:	Apply the knowledge of strategy formulation and its implementation.
CO5:	Gain knowledge of Strategic management process and control towards firm's success
Course Code: 17400302	
Course Title : Legal Aspects Of Business	
CO1:	Overview of Legal Aspects of Business.

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CO2:	Knowledge of sale of goods act, unpaid seller rights, consumer protection act.
CO3:	Demonstrate the knowledge of Agency contract and negotiable instrument act.
CO4:	Gain knowledge of partnership act. Gain knowledge of Formation of companies
Course Code: : 17400303	
Course Title : Business Ethics And Corporate Governance	
CO1:	To understand the theories of Business ethics.
CO2:	Knowledge of dealing Ethical problems of Business.
CO3:	Demonstrate the concepts of work ethics.
CO4:	Apply the knowledge of Ethics in real life situation
CO5:	Gain knowledge of Corporate governance issues.
Elective –I	
Marketing	
Course Code: 17400361A	
Course Title: Retail Management	
CO1:	Understand the basic theories, principles, practices and terminology related to each functional area of business.
CO2:	Identify the key stakeholders and the roles/responsibilities of retailers towards these stakeholders.
CO3:	Product and merchandise mix, pricing, location and store- design, promotions, and store Management - to improve the total customer experience and retailer market Competitiveness.
CO4:	Interpret retail problems and be capable of critically evaluating and applying appropriate Retail management models and theories to generate strategic and tactical solutions
CO5:	Explain the central role of retail in industrialised societies, and the impact of key Market/retail trends upon this sector in the local and global contexts.
HR	
Course Code: 17400363A	
Course Title : - PERFORMANCE MANAGEMENT	
CO1:	Able to understand the practical implications of PM. CO2: Gain knowledge of Performance planning, appraisal and characteristic of reward system and counseling.
CO3:	Enable to design performance appraisal tools for different job descriptions.
CO4:	Apply the knowledge to develop effective team building.
CO5:	Learn the techniques of monitoring and problem solving skills.
FINANCE	
Course Code: 17400362	
Course Title : Security Analysis and Portfolio Management	
CO1:	Analysis and evaluation of financial markets, trading of securities, mutual funds.
CO2:	Construct optimal portfolios and application of asset pricing models.
CO3:	Study of Fundamental and Technical Analysis
CO4:	Analysis of bond prices yields and fixed-income portfolios.
CO5:	Role of options and futures and their use as hedging instruments.
Elective –II	
Marketing	

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Course Code: 17400361B	
Course Title : CONSUMER BEHAVIOR	
CO1:	Identify the consumer need in the view of business growth and understand the environmental influences on consumer behavior.
CO2:	Gain the knowledge in psychological foundations of consumer behavior.
CO3:	Apply the knowledge in consumer decision making process.
CO4:	Gain the knowledge on consumer issues.
CO5:	Enlighten the concepts of legal protection towards consumer issues
HR	
Course Code: 17400363B	
Course Title : - Strategic Human Resource Management	
CO1:	To understand how to interpret basic statistical analysis of HRM data, theoretical perspectives of SHRM approaches.
CO2:	To understand various features of HRM systems influence the composition of workers attracted to the firm and strategic HR planning model.
CO3:	To understand how the various features of HRM Systems Influence Retention and turnover.
CO4:	To analyze a firm's HRM Systems evaluate its strengths and weaknesses, and propose changes to improve it.
CO5:	To acquire knowledge of the legal and institutional landscape for HRM systems and evaluation of strategic contribution of traditional areas and emerging areas.
FINANCE	
Course Code: 17400362B-	
Course Title: Banking & Insurance	
CO1:	To understand the theory and practices of banking. To know the features of bank credit, types of lending, assessment of worthiness of borrower and NPAs.
CO3:	To know the need of regulating bank capital, retail banking, plastic money, NEFT, RTGS, Mobile banking, Banc assurance.
CO4:	To understand the principles and characteristics of insurance, underwriting, concept of reinsurance, an overview of IRDA.
CO5:	To understand the life and general insurance, the actuarial science, Micro insurance in India.
Course outcomes for II Year II Semester Course	
Course Code: 17400401	
Course Title: Logistics And Supply Chain Management	
CO1:	Provide learners with knowledge and skills in information systems and qualitative analysis needed in logistics and supply chain management.
CO2:	To gain knowledge of impact of logistics on shareholder value and customer profitability analysis.
CO3:	Gain the knowledge of setting benchmarking priorities and economics of distribution.
CO4:	Student can have the knowledge of pricing and revenue management and Bullwhip Effect.
CO5:	Apply skills in Global logistics, Global strategies, Channels in Global logistics and Global Alliances.
Course Code: 17400402	
Course Title :Entrepreneurship Development	
C01:	Understand the mindset of the entrepreneurs.
C02:	

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	Apply sound business and economic principles to successfully launch and Effectively manage a new venture.
C03:	To develop an idea on the legal framework and also understand strategic Perspectives in entrepreneurship and Project Management.
C04:	Develop analytical and critical thinking skills necessary to make sound financial Decisions in business and personal arenas.
C05:	Exhibit financial and management skills necessary to succeed in increasingly Challenging academic environments of further higher education.
Elective-III	
Marketing	
The students will be able to recognize the characteristics of services, understand consumer behavior in services, align service design and standards, delivering service, managing services promises.	
FINANCE	
Course Code: : 17400462A	
Course Title: International Financial Management	
CO1:	To understand the role of currency in international financial markets and exchange rate procedures.
CO2:	To know the participants in foreign exchange market, currency derivatives, FEMA.
CO3:	To know foreign direct Investment (FDI), modes of foreign investment, international cash management, capital structure decisions and project financing.
CO4:	To know the types of risk in multinational corporations, hedging.
CO5:	To know the types of taxes at the international level, tax treaties.
CO6:	The students can also emerge as good traders of currency futures as they will come to know about hedging, speculation and various international corporate taxation procedures
Elective-III	
Marketing	
Course Code: 17400461B	
Course Title: Promotion And Distribution Management	
CO1:	Understand practical implications of Sales Management, i.e., sales planning , Budgeting.
CO2:	Apply the knowledge in preparing Advertisement & themes of Advertising etc..,
CO3:	Gain the knowledge of Advertisement Budget preparation and Decision Making
CO4:	Apply the knowledge in Channels management decision
CO5:	Enlighten the Wholesalers & Retailer theories.
HR	
Course Code : 17400463A	
Course Title: Global Human Resource Management	
CO1:	Overview of HRM and GHRM
CO2:	Knowledge of HR issues and concern of cross cultural theories and negotiations
CO3:	Demonstrate the knowledge of Domestic and International recruitment and training process
CO4:	Apply the knowledge for HRD
CO5:	Gain knowledge of Employees' compensation at global level , diversity management and IR at global level
Finance	
Course Code: 17400462B	

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Course Title: Financial Risk Management	
CO1:	The students will gain knowledge in the risk management process.
CO2:	The student understands the economic environment in which such instruments operate.
CO3:	To Developing and employing theoretical valuation methods.
CO4:	The student understand financial instruments such as options, futures, swaps and other derivative securities in detail
CO5:	Application of financial instruments in managing the risk of investing and hedging activity at the individual and the corporate level.
HR	
Course Code: 17400463B	
Course Title : Change Management And Organizational Development	
CO1:	Study how environmental events affect organizations and drive the need for continuous Change.
CO2:	Analyze change at the individual, group, and systemic levels ·
CO3:	Contrast planned and unplanned change ·
CO4:	Evaluate and apply integrative models for assessing, diagnosing, and implementing the need for change .
CO5:	Identify the role of leaders and managers, change agents, and change recipients in various stages of organizational change ·
CO6:	Comprehend the complexity of change within organizational cultures and systems

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GR-17 Master of Computer Applications

Department Vision:

To achieve and evolve as a centre of academic excellence and research in the field of computer applications.

Department Mission:

To realize the vision, the Dept. of Computer Applications will take up following activities:

- Preparing students on latest trends in techniques by doing suitable changes in syllabus and maintaining very good academic report.
- Providing the students with in-depth understanding of technology by establishing specialized labs.
- Conducting trainings in high tech areas of computing as well as providing an environment of deep learning leading to innovative projects.
- Maintaining strong liaison with industry and creating an environment of competition for students.
- Putting efforts in strengthening student in all aspects like concern for society, better citizens, ethics and moral values, while respecting tradition.

Program Educational Objectives (PEOs):

PEO1	Working professionals in problem solving and programming skills in various computing fields of IT industries.
PEO2`	To prepare the students to pursue higher studies in computing or related disciplines and to work in the fields of teaching and initiating them to take up research.
PEO3	To promote students capability to set up their own enterprise in various sectors of computer application.

Program Specific Outcomes (PSOs):

PSO1	Work as professionals in problem solving and programming skills in various computing fields of IT industries.
PSO2`	Prepare the students to pursue higher studies in computing or related disciplines and to work in the fields of teaching and initiating them to take up research.
PSO3	Promote students capability to set up their own enterprise in various sectors of computer application

Program Outcomes(POs):

After completion of the programme, the post graduate in computer application will be able to

1	Apply mathematical foundation, computing and domain knowledge for the conceptualization of computing model of problems.
2	Identify, analyze the computing requirements of a problem and Solve them using computing principles.
3	Design and Evaluate a computer based system, components and process to meet the specific needs of applications.
4	Develop and integrate effectively system based components into user environment.
5	Identify opportunities and use innovative ideas to create value and wealth for the betterment of the individual and society.
6	Use current techniques and tools necessary for complex computing practices.

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7	Use suitable architecture or platform on design and implementation with respect to performance.
8	Commit to cyber regulations and responsibilities in Professional and computing practices.
9	Take up societal, environmental, health, legal, ethical issues within local and global contexts and the consequential responsibilities relevant to professional practice.
10	Identify opportunities and use innovative ideas to create value and wealth for the betterment of the individual and society.
11	Use knowledge to analyze, interpret the data and synthesis the information to derive valid conclusions using research methods.
12	Expertise in developing applications with required domain knowledge.

Course Outcomes for First Year First Semester Course	
Course Code : 17300101	
Course Title: Computer Programming	
CO1	Write clear, elementary C programs, understand algorithmic thinking and apply it to Programming.
CO2	Apply for problem-solving techniques.
CO3	Code with C arithmetic, increment, decrement, assignment, relational, equality and logical operators
CO4	Code C control structures (if, if/else, switch, while, do/while, for) and use built-in data types.
CO5	Use standard library functions and write user-defined function definitions.
Course Code : 17300102	
Course Title: Digital Logic Design	
CO1	Design Combinational sequential circuits.
CO2	They should be in a position to continue with computer organization.
CO3	To recognize Logic level models, including Boolean algebra, finite state machines, Arithmetic circuits and hardware description languages.
CO4	Describe Logic gates, memory, including CMOS gates, flip-flops, arrays.
CO5	Design tools, both manual and computerized, for design, optimization, and test of logic circuits.
CO6	Describe the design criteria, including area, speed, power consumption, and testability.
Course Code : 17300103	
Course Title: Discrete Mathematical Structures and Graph Theory	
CO1	Have knowledge of the concepts needed to test the logic of a program.
CO2	Identify mathematical structures on various levels.
CO3	Be aware of a class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
CO4	Be aware of the counting principles
CO5	Be exposed to concepts and properties of algebraic structures such as semi groups, monoids and groups.
Course Code : 17300104	
Course Title: Human Resource Management	
CO1	Describe what human resource management is and how human resource management relates to effective and successful organizations.
CO2	Articulate the critical issues and challenges involved in contemporary human resource management.

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CO3	Discriminate between different types of human resource strategies, models, theories and approaches.
CO4	Develop plans relating to central HR issues.
CO5	Highlight particular issues that determine the success or failure of human resource management practices.
Course Code : 17300105	
Course Title: Accounting and Financial Management	
CO1	Solve ethical issues related to the accounting profession.
CO2	Prepare financial statements in accordance with Generally Accepted Accounts
CO3	Develop Financial accounting methods on the financial statements.
CO4	Build the audit process from the engagement planning stage through completion of the audit, as well as the rendering of an audit opinion via the various report options.
CO5	Recognize current auditing standards and acceptable practices, as well as the impact of audit risk on the engagement.
Course Code : 17300111	
Course Title: English Communication Lab	
CO1	Recognize the nuances of English language through audio-visual experience and group Activities.
CO2	Neutralize of accent for intelligibility.
CO3	Improve Speaking skills with clarity and confidence which in turn enhances their Employability skills.
Course Code : 17300112	
Course Title: Computer Programming Lab	
CO1	Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming
CO2	Acquire knowledge about the basic concept of writing a program.
CO3	Recognize constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
CO4	Use of conditional expressions and looping statements to solve problems Associated with conditions and repetitions.
CO5	Use functions involving the idea of modularity.
CO6	Construct structures and unions through which derived data types can be formed
CO7	Implement file handling for permanent storage of data or record.
Course Code : 17300113	
Course Title: Digital Logic Design Lab	
CO1	Describe the architecture of modern computer.
CO2	Analyze the Performance of a computer using performance equation
CO3	Calculate the effective address of an operand by addressing modes
CO4	Understand how a computer performs arithmetic operation of positive and negative numbers.
CO5	Understand how cache mapping occurs in computer and can solve various problems related to this Secondary storage organization and problem solving.

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Course Outcomes for First Year Second Semester Course	
Course Code : 17300201	
Course Title: Data Structures	
CO1	Learn how to use data structure concepts for realistic problems.
CO2	Ability to identify appropriate data structure for solving computing problems in respective language
CO3	Ability to solve problems independently and think critically.
Course Code : 17300202	
Course Title: Computer Organization	
CO1	To apply the knowledge of performance metrics to find the performance of systems.
CO2	To create an assembly language program for a microprocessor system.
CO3	To design a hardware component for an embedded system
CO4	To deal with different types of computers
CO5	To identify high performance architecture design
Course Code : 17300203	
Course Title: OOPS Through Java	
CO1	Understand of the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs.
CO2	Develop object oriented constructs such as various class hierarchies, interfaces & exception handling .
CO3	Able to implement, compile, test and run Java programs comprising more than one class, to address a particular software problem.
CO4	Demonstrate the ability to use simple data structures like arrays in a Java program.
CO5	Make use of members of classes found in the Java API
CO6	Develop various types of selection constructs in a Java program.
CO7	Know about the creation of applets & using it and application oriented knowledge on swings.
Course Code : 17300204	
Course Title: Organizational Structures and Personnel Management	
CO1	Understand the importance of organizational structure and design on internal organizational.
CO2	Understand the relationships between organization structure and the behavior of those who work in them or otherwise interact with them.
CO3	Recognize the managerial implications of organization design and change and how these are informed by the relevant theories.
CO4	Appreciate the impact of advanced technologies on the strategy and structure of organizations and how to address the changes implied by the adoption of these technologies.
CO5	Understand the Personnel Functions like position of the personnel department in the organization
Course Code : 17300205	
Course Title: Intellectual Property Rights & Professional Ethics	
CO1	Understand intellectual property rights and trademarks
CO2	Model in different views in patent law and international patent law
CO3	Identify and analyze intellectual property rights and law of trademarks

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CO4	Identify the infringement of different laws basing on ownership, transfers , duration, registration and searching
CO5	Know about the importance of software quality, social networking and ethical Issues .
Course Code : 17300211	
Course Title: DATA STRUCTURES LAB	
CO1	Identify the appropriate data structure for given problem.
CO2	Design and analyze the time and space complexity of algorithm or program.
CO3	Effectively use different data structures for solving real application problems.
Course Code : 17300212	
Course Title: OOPS Through Java Lab	
CO1	Write, compiling and execute basic Java program.
CO2	Know the use of data types and variables, decision control structures: if, nested if,etc.
CO3	Understand the use loop control structures: do, while, for etc.
CO4	Create classes and objects and use them in their program.
CO5	Know the use of OOP's concept i.e data abstraction, data hiding, encapsulation, Inheritance and polymorphism.
CO6	Create and use threads, handle exceptions and write applets.
CO7	Develop programs to create interfaces ,inner classes and wrapper classes.
Course Code : 17300213	
Course Title: IT Workshop	
CO1	To know the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers.
CO2	Understand the hardware and software level trouble shooting process, tips and tricks.
CO3	Masters in working PC to disassemble and assemble to working condition and install Windows and Linux on the same PC.
CO4	Having awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks.
CO5	Design in crafting professional word documents; excel spread sheets and power point presentations using the Microsoft suite of office tools and Latex.

Course Outcomes for Second Year Third Semester Course	
Course Code : 17300301	
Course Title: Probability and Statistics with R	
CO1	Use of R programming for Statistical applications.
CO2	Understand the different data structures in R.
CO3	Use Sampling and find errors using R.
CO4	Acquaint with Graphics and Charts through R Programming,
CO5	Use ANOVA classification.
Course Code : 17300302	
Course Title: Data Base Management Systems	

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CO1	Master the basics of SQL and construct queries using SQL.
CO2	Analyze the difference between traditional file system and DBMS.
CO3	Work with different data base languages.
CO4	Draw various data models for data base.
CO5	Be familiar with the relational database theory, and be able to write relational algebra expressions for queries.
CO6	Design schema and normalize data.
CO7	Understand how query are being processed and executed.
CO8	Deal with online transactions and control concurrency.
CO9	Work with indexing and sorting in disk files.
CO10	Understand types of data base failures and recovery.
Course Code : 17300303	
Course Title: Operations Research	
CO1	Be proficienct with tools from optimization, probability, statistics and simulation.
CO2	Understand engineering economic analysis, including fundamental applications.
CO3	Develop tools in industry and the public sector.
CO4	Facilitate mathematical and computational modeling of real decision-making problems.
CO5	Use modeling tools and computational tools.
CO6	Develop analytic skills to evaluate the problems.
CO7	Facilitate with the design, implementation, and analysis of computational experiments.
Course Code : 17300304	
Course Title: Computer Networks	
CO1	Independently understand basic computer network technology.
CO2	Identify the different types of network topologies and protocols.
CO3	Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
CO4	Identify the different types of network devices and their functions within a network
CO5	Understand and building the skills of subnetting and routing mechanisms.
CO6	Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.
CO7	Be familiar with wireless networking concepts
Course Code : 17300305	
Course Title: Design & Analysis of Algorithms	
CO1	Able to analyze and design algorithms and to appreciate the impact of algorithm design in practice.
CO2	Understand how the best, worst optimum case time complexity of an algorithm is defined
CO3	Know how a number of algorithms exists for fundamental problems in computer science and engineering work and compare with one another.
CO4	Know how asymptotic notation is used to provide a rough classification of algorithms

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CO5	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
CO6	Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
Course Code : 17300311	
Course Title: Probability and Statistics with R Lab	
CO1	Applying concepts of data inputting and basic statistics in R
CO2	Implementing statistical modeling in R
CO3	Implementing various functions and programming in R
Course Code : 17300312	
Course Title: Database Management Systems Lab	
CO1	Understand SQL Fundamentals.
CO2	Perform table operations.
CO3	Work with objects in databases.
CO4	Develop Table ,View, Log & Triggers.
CO5	Use PL/SQL for working with data
CO6	Develop Embedded and Nested Queries.
Course Code : 17300313	
Course Title: Python Programming Lab	
CO1	Design, create, build, and debug Python applications.
CO2	Write and apply decision and loop structures for different applications.
CO3	Write GUI based code for applications.
CO4	Write and apply procedures, sub-procedures, and functions to create manageable code.
CO5	Create one and two dimensional arrays for sorting, calculating, and displaying of data.
Course Outcomes for Second Year Forth Semester Course	
Course Code : 17300401	
Course Title: Operating Systems	
CO1	Understand the difference between different types of modern operating systems, virtual machines and their structure of implementation and applications.
CO2	Understand the concepts of deadlock in operating systems and how they can be managed / avoided and implement them in multiprogramming system.
CO3	Understand the design and management concepts along with issues and challenges of main memory, virtual memory and file system.
CO4	Relate master system resources sharing among the users
CO5	Master issues related to file system interface and implementation, Disk management
Course Code : 17300402	
Course Title: Web Technologies	
CO1	Understand XML and how to parse and use XML data with Java
CO2	Use the knowledge for developing web pages for different applications.
CO3	Identify with the need for and be able to write validated XHTML 1.0.

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CO4	Apply sound, non-browser specific web design principles.
CO5	Use JavaScript to access the DOM to reference web document object CSS properties.
CO6	Understand and apply Javascript, JSP, CSS & XHTML to create dynamic XHTML.
CO7	Be aware of emerging technologies and developing W3C recommendation.
Course Code : 17300403	
Course Title: Software Engineering	
CO1	Identify the minimum requirements for the development of application.
CO2	Develop, maintain, efficient, reliable and cost effective software solutions
CO3	Critically thinking and evaluate assumptions and arguments
CO4	Understand the process to be followed in the software development life cycle.
CO5	Analyze quality of software.
Course Code : 17300404	
Course Title: Cryptography & Network Security	
CO1	Design efficient secure algorithms for message communication.
CO2	Masters in creation of digital signatures.
CO3	Awareness about Intruders and Hackers.
CO4	Knowledge about key generation , various attacks and viruses.
Course Code : 17300461A	
Course Title: Human Computer Interaction	
CO1	Design good user interface
CO2	Understand the requirements as a user.
CO3	Understand the usage of different software tools and interaction devices in user interface.
CO4	Understand the basic navigation tools and components in windows and their usage.
CO5	Understand interaction devices in user interface.
Course Code : 17300461B	
Course Title: Cloud Computing	
CO1	Understand the systems, protocols and mechanisms to support cloud computing.
CO2	Develop applications for cloud computing.
CO3	Understand the hardware necessary for cloud computing.
CO4	Design and implement a novel cloud computing application.
CO5	Handle the security features in cloud computing.
Course Code : 17300461C	
Course Title: Mobile Computing	
CO1	Explain the basics of mobile telecommunication system
CO2	Choose the required functionality at each layer for given application
CO3	Identify solution for each functionality at each layer
CO4	Use simulator tools and design Ad hoc networks
CO5	Develop a mobile application.
Course Code : 17300411	
Course Title: OPERATING SYSTEMS LAB	

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CO1	Use Unix utilities and perform basic shell control of the utilities
CO2	Use the Unix file system and file access control.
CO3	Use of an operating system to develop software
CO4	Use Linux environment efficiently
CO5	Solve problems using bash for shell scripting
Course Code : 17300412	
Course Title: Web Technologies Lab	
CO1	Design and implement a basic website.
CO2	Implement different navigation strategies.
CO3	Use client-side technologies (XHTML, CSS, forms, JavaScript, and
CO4	Use server-side technologies (Servlets and JSP) to implement websites.
CO5	Develop simple back-end database to support a website.
CO6	Recognize and evaluate website organizational structure and design elements.
CO7	Create XML applications.
Course Code : 17300421	
Course Title: Mini Project	
CO1	Gain practical experience of working on real applications
CO2	Apply the concepts learned by them in various subjects.
CO3	Gain experience of working as a team or group.
CO4	Understand the importance of planning and designing in application design.

Course Outcomes for Third Year Fifth Semester Course	
Course Code : 17300501	
Course Title: Data Warehousing and Data Mining	
CO1	Understand why the data warehouse in addition to traditional database systems.
CO2	Perform the preprocessing of data and apply mining techniques on it.
CO3	Identify the association rules, classification and clusters in large data sets.
CO4	Solve real world problems in business .
CO5	Solve real world problems scientific information using data mining.
Course Code : 17300502	
Course Title: OOAD through UML	
CO1	Analyse the case studies.
CO2	Model in different views with respect user requirement.
CO3	Designing use case, logical, component and deployment.
CO4	Prepare document of any project.
CO5	Model a real world application by using ER-Diagrams.
Course Code : 17300503	
Course Title: Computer Graphics and Multimedia Systems	
CO1	solve a wide range of graphic design problems.

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CO2	Interactive experiences for a wide range of audiences.
CO3	Use various software programs used in the creation and implementation of multi-media (interactive, motion/animation, presentation, etc.).
CO4	Known relationship between critical analysis and the practical application of design.
CO5	Develop issues related to emerging electronic technologies and graphic design.
Course Code : 17300562A	
Course Title: Software Project Management	
CO1	Capable to determine the purpose and importance of project management from the Perspectives of planning, tracking and completion of project.
CO2	Compare and differentiate organization structures and project structures.
CO3	Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.
Course Code : 17300562B	
Course Title: Data Science	
CO1	Apply fundamental algorithmic ideas to process data.
CO2	Leverage algorithmic insights in order to design novel data science algorithms.
CO3	Develop a solid background on foundations of data science algorithms.
CO4	Determine running times for common algorithms that process large-scale data.
CO5	Usage of terminology related to data science.
Course Code : 17300562C	
Course Title: Mobile Application Development	
CO1	Design, implement and evaluate a User Interface for a mobile application using J2ME.
CO2	Create a small but realistic working mobile application for small computing devices.
CO3	Categorize the challenges posed by developing mobile applications and be able to Propose and evaluate and select appropriate solutions.
CO4	Install and configure Android application development tools.
CO5	Design and develop user Interfaces for the Android platform.
CO6	Save state information across important operating system events.
Course Code : 17300562D	
Course Title: Machine learning	
CO1	Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
CO2	Discuss the decision tree algorithm and identify and overcome the problem of over fitting
CO3	Discuss and apply the back propagation algorithm and genetic algorithms to various problems
CO4	Apply the Bayesian concepts to machine learning
CO5	Analyse and suggest appropriate machine learning approaches for various types of problems
Course Code : 17300563A	
Course Title: Software Testing Methodologies	
CO1	Apply software testing knowledge and engineering methods.
CO2	Design and conduct a software test process for a software testing project.
CO3	Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.

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CO4	Use software testing methods and modern software testing tools for their testing projects.
Course Code : 17300563B	
Course Title: Artificial Intelligence	
CO1	Identify the problems that are amenable to solution by AI methods.
CO2	Identifying appropriate AI methods to solve a given problem.
CO3	Formalize a given problem in the language/framework of different AI methods.
CO4	Implementing basic AI algorithms.
CO5	Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.
Course Code : 17300563C	
Course Title: E-Commerce	
CO1	Understand modern computing infrastructures from the perspective of the internet and Organizations.
CO2	Having ability to solve theoretical and practical issues of conducting business over the internet and the Web
CO3	Reflect on general principles revealed through practical exploration of specific tools, techniques and methods in e-business.
Course Code : 17300511	
Course Title: Data Warehousing And Data Mining Lab	
CO1	Apply data mining techniques in real applications.
CO2	Decision on which concepts to be used and how to be used in applications.
CO3	Design a Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment.
CO4	Design a data warehouse or data mart to present information needed by management in a form that is usable for management client.
Course Code : 17300512	
Course Title: OOAD through UML Lab	
CO1	Understand the Case studies and design the Model.
CO2	Understand how design patterns solve design problems.
CO3	Develop design solutions using creational patterns.
CO4	Construct design solutions by using structural and behavioral patterns.
CO5	Able to construct UML diagrams for static view and dynamic view of the system.
CO6	Model creational patterns by applicable patterns for given context.
CO7	Create refined model for given Scenario using structural patterns.
CO8	Able to construct behavioral patterns for given applications.

Course Outcomes for Third Year Sixth Semester Course	
Course Code : 17300601	
Course Title: BIG DATA ANALYTICS	
CO1	Understand how to leverage the insights from big data analytics
CO2	Analyze 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

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Course Code : 17300611	
Course Title: BIG DATA ANALYTICS LAB	
CO1	Able to install Pig, Hive, SPARK and configure Hadoop and HDFS
CO2	Process big data using Hadoop framework
CO3	Understand R programming basics.
CO4	Build and apply linear and logistic regression models
CO5	Perform data analysis with machine learning methods

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GR-17 DEPARTMENT OF MANAGAMENT STUDIES

Department Vision

To be a centre of excellence for management education and nurture young minds into professionals with values, passion, integrity and entrepreneurial spirit.

Department Mission

- Offer enriching learning experience.
- Provide cutting edge paradigms to the aspiring Managers.
- Highlight the contemporary Management practices and enlighten the budding Managers.
- Adopt Innovative Approach in introducing business world to the students.
- Influence the students with uncompromising Human Values so as to make them as ideal Corporate Citizens.

Program Educational Objectives(PEOs):

PEO1	Engage in ongoing learning and professional development through self- study, continuing education in Electrical and Electronics Engineering and also in other allied fields
PEO2	Apply their engineering skills, exhibiting critical thinking and problem solving skills in professional engineering practices or tackle social, technical and business challenges
PEO3	Improve professional competence through lifelong learning including higher education and research

Program Specific Outcomes(PSO's):

PSO1	Demonstrating professionalism, self-awareness, leadership and effective communication skills
PSO2	Possessing the skills requiring to work and lead effectively in a team based environment
PSO3	Integrating tools and concepts from multiple functional areas (i.e., Finance, HR, Marketing, Operations etc.,) to solve business problems
PSO4	Understanding concepts of Information Technology (IT) and how IT can improve organizational performance. Identifying key issues facing a business or business sub-division
PSO5	Utilizing qualitative and quantitative methods to investigate and solve critical business problems.
PSO6	Evaluating and integrating ethical considerations when making business decisions.
PSO7	Incorporating diversity and multicultural perspectives while making business decisions.

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Program Outcomes (POs): MBA Graduates will able to:

1	To develop ideas and ideologies to inspire and impress the business world with effective personality and communication skills.
2	To be proactive to critical situations and changes of business management.
3	To be responsive for the difficulties of the society with possible solutions.
4	To sustain in competition with optimal performance.
5	To practice knowledge management for potential enrichment.
6	To make continuous improvement and practice Kaizen.
7	To execute feasibility study for effective decision making.
8	To contribute to business consultancy.
9	To be a Professional with care for, concern and consistency in performance.
10	To be trust worthy

Course outcomes (CO's) of all courses of all programs offered by the institution

Regulation: GRMBA 17

Course outcomes for First Year First Semester Course	
Course Code: : 17400101	
Course Title: Management Theory and Practices	
CO1:	To provide a rich pool of contemporary Management knowledge .
CO2:	To gain the knowledge in time tested principles, basic concepts, emerging ideas, evolving theories, and latest techniques.
CO3:	To understand the ever changing procedures & practices in the field of Management in a comprehensive way
CO4:	Students can gain the knowledge of contemporary issues like MBO, SIX SIGMA, TQM etc.,
CO5:	To enable the students to understand critical decisions that ensure growth and sustainability of the organization.
Course Code: 17400102	
Course title: Managerial Economics	

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CO1:	Enable students to get the basic economic principles, forecast demand and supply and
CO2:	Should be able to estimate cost and understand market structure and pricing practices
CO3:	To gain knowledge in Pricing methods, market structures and various Concepts.
CO4:	The module draws on student prior learning and combines insights from economics.
CO5:	Finding solutions to various problems that arise in ordinary business life
Course Code: 17400103	
Course Title: Accounting For Managers	
CO1	Student shall be able to apply accounting concepts, principles, standards and processes
CO2	Student must demonstrate analytical skills through findings, organizing, assessing and analyzing data appropriate to a given situation.
CO3	Student must demonstrate skills in financial analysis.
CO4	Each student must identify and analyze financial statements.
Course Code: 17400104	
Course Title: Managerial Communication & Soft Skills and Business Etiquette	
CO1:	To develop communication skills.
CO2:	To gain Knowledge of intra personal and inter personal communication skills.
CO3:	To demonstrate the knowledge of formal and informal report writing
CO4:	Apply the knowledge of problem solving
CO5:	Gain knowledge of communicating through social media and mobile
Course Code: 17400105	
Course Title: Business Environment	
CO1:	To provide a rich pool of contemporary knowledge.
CO2:	To gain the knowledge in time tested principles, basic concepts, emerging ideas, evolving theories, and latest techniques .
CO3:	To understand the ever changing procedures & practices in the field of law in a Comprehensive way.
CO4:	Students can gain the knowledge on balance of payments.

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CO5:	Competition Act and BIFR and enable them to understand critical decisions that ensure growth and sustainability of the organization .
Course Code:17400106	
Course Title: Quantities Analysis For Business Decisions	
CO1:	Acquits with data reduction techniques and calculate and interpret measures of central values and dispersion.
CO2:	Understands and applies decision making in business and marketing.
CO3:	Performs optimization techniques like linear programming.
CO4:	Aware of application techniques in transportation assignment and replacement problem.
CO5:	Can draw Net work diagram for project and draw conclusion from it.
Course Code: 174005	
CO1:	To know the process of assembling a personal computer, installation of system software
CO2:	Like MS Windows, Linux and the required device drivers.
CO3:	Understand the hardware and software level trouble shooting process, tips and tricks.
CO4:	Masters in working PC to disassemble and assemble to working condition and install
Course outcomes for First Year Second Semester Course	
Course Code: 17400201	
Course Title :Financial Management	
C01:	Understand the basic type of financial management decisions and the role of the financial manager.
C02:	Identify tools used by Finance professionals in making financial decisions.
C03:	Explain how the manager's decisions are reflected in the share prices.
C04:	Specify the objective hat ensure Financial Managers makes rational investment and how they make short term investment decisions.
C05:	Examine the implications of stakeholders, ethics and the agency relationships
Course Code: 17400202	
Course Title : Human Resource Management	
CO1:	Analyze the broad fundamental concepts of HRM.
CO2:	Assess the processes to build a talented work force (include recruitment and selection, training and development, professional development plans).

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CO3:	Evaluate performance and mange effectively in unionized environment.
CO4:	Use the qualitative and quantitative information to make effective decisions related to functional areas of business.
CO5:	Mange group and individual dynamics in organization.
Course Code: 17400203	
Course Title : Marketing Management	
CO1:	By reading text and relating the concepts through cases the student would be able to understand the concepts of marketing management.
CO2:	They will be able to analyze markets and design customer driven strategies and will be able to communicate the decisions towards business development with customer relation as focus.
Course Code: 17400204-	
Course Title: 111- IT-LAB	
CO1:	Students will identify operational and administrative processes and roles and responsibilities of operation managers in different organizational contexts.
CO2:	Students can analyze the content of an operations strategy and the decision involved.
CO3:	Understand the input – process-output framework ,the extensions of it and apply them to a wide range of operations.
CO4:	Students can gain the knowledge of forecasting techniques in operations and productions methods.
Course Code: 17400205	
Course Title : Business Research Methods	
CO1 :	Theoretical and Applied Research
CO2:	Knowing Data collection Methods
CO3:	Questionnaire Preparation
CO4:	Preparation of Quality Control Charts
CO5:	Gain Knowledge in Research Techniques
Course Code: 17400206	
Course Title : Organizational Behaviour	
CO1:	Analyze the behaviour of individuals and groups in organizations in terms of the key factors that influence organizational behaviour.
CO2:	Assess the potential effects of organizational-level factors (such as structure, culture and change) on organizational behaviour.
CO3:	Critically evaluate the potential effects of important developments in the external environment (such as globalization and advances in technology) on organizational behaviour.

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CO4:	Analyze organizational behavioural issues in the context of organizational behaviour theories, models and concepts
Course outcomes for II Year I Semester Course	
Course Code: 17400301	
Course Title : -Strategic Management	
CO1:	Overview of strategic management.
CO2:	Knowledge of environmental analysis and framing of strategy.
CO3:	Demonstrate the knowledge of leadership styles and planning of strategy.
CO4:	Apply the knowledge of strategy formulation and its implementation.
CO5:	Gain knowledge of Strategic management process and control towards firm's success
Course Code: 17400302	
Course Title : Legal Aspects Of Business	
CO1:	Overview of Legal Aspects of Business.
CO2:	Knowledge of sale of goods act, unpaid seller rights, consumer protection act.
CO3:	Demonstrate the knowledge of Agency contract and negotiable instrument act.
CO4:	Gain knowledge of partnership act. Gain knowledge of Formation of companies
Course Code: : 17400303	
Course Title : Business Ethics And Corporate Governance	
CO1:	To understand the theories of Business ethics.
CO2:	Knowledge of dealing Ethical problems of Business.
CO3:	Demonstrate the concepts of work ethics.
CO4:	Apply the knowledge of Ethics in real life situation
CO5:	Gain knowledge of Corporate governance issues.
Elective –I	
Marketing	
Course Code: 17400361A-	
Course Title: Retail Management	
CO1:	Understand the basic theories, principles, practices and terminology related to each functional area of business.

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CO2:	Identify the key stakeholders and the roles/responsibilities of retailers towards these stakeholders.
CO3:	Product and merchandise mix, pricing, location and store- design, promotions, and store Management - to improve the total customer experience and retailer market Competitiveness.
CO4:	Interpret retail problems and be capable of critically evaluating and applying appropriate Retail management models and theories to generate strategic and tactical solutions
CO5:	Explain the central role of retail in industrialised societies, and the impact of key Market/retail trends upon this sector in the local and global contexts.
HR	
Course Code: 17400363A	
Course Title : - PERFORMANCE MANAGEMENT	
CO1:	Able to understand the practical implications of PM. CO2: Gain knowledge of Performance planning, appraisal and characteristic of reward system and counselling.
CO3:	Enable to design performance appraisal tools for different job descriptions.
CO4:	Apply the knowledge to develop effective team building.
CO5:	Learn the techniques of monitoring and problem solving skills.
FINANCE	
Course Code: 17400362	
Course Title : Security Analysis and Portfolio Management	
CO1:	Analysis and evaluation of financial markets, trading of securities, mutual funds.
CO2:	Construct optimal portfolios and application of asset pricing models.
CO3:	Study of Fundamental and Technical Analysis
CO4:	Analysis of bond prices yields and fixed-income portfolios.
CO5:	Role of options and futures and their use as hedging instruments.
Elective –II	
Marketing	
Course Code: 17400361B	
Course Title : CONSUMER BEHAVIOR	
CO1:	Identify the consumer need in the view of business growth and understand the environmental influences on consumer behavior.

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CO2:	Gain the knowledge in psychological foundations of consumer behavior.
CO3:	Apply the knowledge in consumer decision making process.
CO4:	Gain the knowledge on consumer issues.
CO5:	Enlighten the concepts of legal protection towards consumer issues
HR	
Course Code: 17400363B	
Course Title : - Strategic Human Resource Management	
CO1:	To understand how to interpret basic statistical analysis of HRM data, theoretical perspectives of SHRM approaches.
CO2:	To understand various features of HRM systems influence the composition of workers attracted to the firm and strategic HR planning model.
CO3:	To understand how the various features of HRM Systems Influence Retention and turnover.
CO4:	To analyze a firm's HRM Systems evaluate its strengths and weaknesses, and propose changes to improve it.
CO5:	To acquire knowledge of the legal and institutional landscape for HRM systems and evaluation of strategic contribution of traditional areas and emerging areas.
FINANCE	
Course Code: 17400362B-	
Course Title: Banking & Insurance	
CO1:	To understand the theory and practices of banking. To know the features of bank credit, types of lending, assessment of worthiness of borrower and NPAs.
CO3:	To know the need of regulating bank capital, retail banking, plastic money, NEFT, RTGS, Mobile banking, Banc assurance.
CO4:	To understand the principles and characteristics of insurance, underwriting, concept of reinsurance, an overview of IRDA.
CO5:	To understand the life and general insurance, the actuarial science, Micro insurance in India.
Course outcomes for II Year II Semester Course	
Course Code: 17400401	
Course Title: Logistics And Supply Chain Management	
CO1:	Provide learners with knowledge and skills in information systems and qualitative analysis needed in logistics and supply chain management.
CO2:	To gain knowledge of impact of logistics on shareholder value and customer profitability analysis.

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CO3:	Gain the knowledge of setting benchmarking priorities and economics of distribution.
CO4:	Student can have the knowledge of pricing and revenue management and Bullwhip Effect.
CO5:	Apply skills in Global logistics, Global strategies, Channels in Global logistics and Global Alliances.
Course Code: 17400402	
Course Title :Entrepreneurship Development	
C01:	Understand the mindset of the entrepreneurs.
C02:	Apply sound business and economic principles to successfully launch and Effectively manage a new venture.
C03:	To develop an idea on the legal framework and also understand strategic Perspectives in entrepreneurship and Project Management.
C04:	Develop analytical and critical thinking skills necessary to make sound financial Decisions in business and personal arenas.
C05:	Exhibit financial and management skills necessary to succeed in increasingly Challenging academic environments of further higher education.
Elective-III	
Marketing	
The students will be able to recognize the characteristics of services, understand consumer behavior in services, align service design and standards, delivering service, managing services promises.	
FINANCE	
Course Code: : 17400462A	
Course Title: International Financial Management	
CO1:	To understand the role of currency in international financial markets and exchange rate procedures.
CO2:	To know the participants in foreign exchange market, currency derivatives, FEMA.
CO3:	To know foreign direct Investment (FDI), modes of foreign investment, international cash management, capital structure decisions and project financing.
CO4:	To know the types of risk in multinational corporations, hedging.
CO5:	To know the types of taxes at the international level, tax treaties.
CO6:	The students can also emerge as good traders of currency futures as they will come to know about hedging, speculation and various international corporate taxation procedures
Elective-III	
Marketing	

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Course Code: 17400461B	
Course Title: Promotion And Distribution Management	
CO1:	Understand practical implications of Sales Management, i.e., sales planning , Budgeting.
CO2:	Apply the knowledge in preparing Advertisement & themes of Advertising etc..,
CO3:	Gain the knowledge of Advertisement Budget preparation and Decision Making
CO4:	Apply the knowledge in Channels management decision
CO5:	Enlighten the Wholesalers & Retailer theories.
HR	
Course Code : 17400463A	
Course Title: Global Human Resource Management	
CO1:	Overview of HRM and GHRM
CO2:	Knowledge of HR issues and concern of cross cultural theories and negotiations
CO3:	Demonstrate the knowledge of Domestic and International recruitment and training process
CO4:	Apply the knowledge for HRD
CO5:	Gain knowledge of Employees' compensation at global level , diversity management and IR at global level
Finance	
Course Code: 17400462B	
Course Title: Financial Risk Management	
CO1:	The students will gain knowledge in the risk management process.
CO2:	The student understands the economic environment in which such instruments operate.
CO3:	To Developing and employing theoretical valuation methods.
CO4:	The student understand financial instruments such as options, futures, swaps and other derivative securities in detail
CO5:	Application of financial instruments in managing the risk of investing and hedging activity at the individual and the corporate level.
HR	
Course Code: 17400463B	
Course Title : Change Management And Organizational Development	
CO1:	Study how environmental events affect organizations and drive the need for continuous Change.

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CO2:	Analyze change at the individual, group, and systemic levels ·
CO3:	Contrast planned and unplanned change ·
CO4:	Evaluate and apply integrative models for assessing, diagnosing, and implementing the need for change .
CO5:	Identify the role of leaders and managers, change agents, and change recipients in various stages of organizational change ·
CO6:	Comprehend the complexity of change within organizational cultures and systems

GR-17 DEPARTMENT OF COMPUTER APPLICATIONS

Department Vision:

To achieve and evolve as a centre of academic excellence and research in the field of computer applications.

Department Mission:

To realize the vision, the Dept. of Computer Applications will take up following activities:

- Preparing students on latest trends in techniques by doing suitable changes in syllabus and maintaining very good academic report.
- Providing the students with in-depth understanding of technology by establishing specialized labs.
- Conducting trainings in high tech areas of computing as well as providing an environment of deep learning leading to innovative projects.
- Maintaining strong liaison with industry and creating an environment of competition for students.
- Putting efforts in strengthening student in all aspects like concern for society, better citizens, ethics and moral values, while respecting tradition.

Program Educational Objectives (PEOs):

PEO1	Working professionals in problem solving and programming skills in various computing fields of IT industries.
PEO2	To prepare the students to pursue higher studies in computing or related disciplines and to work in the fields of teaching and initiating them to take up research.
PEO3	To promote students capability to set up their own enterprise in various sectors of computer application.

Program Specific Outcomes(PSOs):

PSO1	Work as professionals in problem solving and programming skills in various computing fields of IT industries.
PSO2`	Prepare the students to pursue higher studies in computing or related disciplines and to work in the fields of teaching and initiating them to take up research.
PSO3	Promote students capability to set up their own enterprise in various sectors of computer application

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Program Outcomes(POs):

After completion of the programme, the post graduate in computer application will be able to

1	Apply mathematical foundation, computing and domain knowledge for the conceptualization of computing model of problems.
2	Identify, analyze the computing requirements of a problem and Solve them using computing principles.
3	Design and Evaluate a computer based system, components and process to meet the specific needs of applications.
4	Develop and integrate effectively system based components into user environment.
5	Identify opportunities and use innovative ideas to create value and wealth for the betterment of the individual and society.
6	Use current techniques and tools necessary for complex computing practices.
7	Use suitable architecture or platform on design and implementation with respect to performance.
8	Commit to cyber regulations and responsibilities in Professional and computing practices.
9	Take up societal, environmental, health, legal, ethical issues within local and global contexts and the consequential responsibilities relevant to professional practice.
10	Identify opportunities and use innovative ideas to create value and wealth for the betterment of the individual and society.
11	Use knowledge to analyze, interpret the data and synthesis the information to derive valid conclusions using research methods.
12	Expertise in developing applications with required domain knowledge.

Course Outcomes (GR-17)

Course Outcomes for First Year First Semester Course	
Course Code : 17300101	
Course Title: Computer Programming	
CO1	Write clear, elementary C programs, understand algorithmic thinking and apply it to Programming.
CO2	Apply for problem-solving techniques.
CO3	Code with C arithmetic, increment, decrement, assignment, relational, equality and logical operators
CO4	Code C control structures (if, if/else, switch, while, do/while, for) and use built-in data types.
CO5	Use standard library functions and write user-defined function definitions.
Course Code : 17300102	
Course Title: Digital Logic Design	
CO1	Design Combinational sequential circuits.
CO2	They should be in a position to continue with computer organization.
CO3	To recognize Logic level models, including Boolean algebra, finite state machines, Arithmetic circuits and hardware description languages.
CO4	Describe Logic gates, memory, including CMOS gates, flip-flops, arrays.

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CO5	Design tools, both manual and computerized, for design, optimization, and test of logic circuits.
CO6	Describe the design criteria, including area, speed, power consumption, and testability.
Course Code : 17300103	
Course Title: Discrete Mathematical Structures and Graph Theory	
CO1	Have knowledge of the concepts needed to test the logic of a program.
CO2	Identify mathematical structures on various levels.
CO3	Be aware of a class of functions which transform a finite set into another finite set which relates to input output functions in computer science.
CO4	Be aware of the counting principles
CO5	Be exposed to concepts and properties of algebraic structures such as semi groups, monodies and groups.
Course Code : 17300104	
Course Title: Human Resource Management	
CO1	Describe what human resource management is and how human resource management relates to effective and successful organizations.
CO2	Articulate the critical issues and challenges involved in contemporary human resource management.
CO3	Discriminate between different types of human resource strategies, models, theories and approaches.
CO4	Develop plans relating to central HR issues.
CO5	Highlight particular issues that determine the success or failure of human resource management practices.
Course Code : 17300105	
Course Title: Accounting and Financial Management	
CO1	Solve ethical issues related to the accounting profession.
CO2	Prepare financial statements in accordance with Generally Accepted Accounts
CO3	Develop Financial accounting methods on the financial statements.
CO4	Build the audit process from the engagement planning stage through completion of the audit, as well as the rendering of an audit opinion via the various report options.
CO5	Recognize current auditing standards and acceptable practices, as well as the impact of audit risk on the engagement.
Course Code : 17300111	
Course Title: English Communication Lab	
CO1	Recognize the nuances of English language through audio-visual experience and group Activities.
CO2	Neutralize of accent for intelligibility.
CO3	Improve Speaking skills with clarity and confidence which in turn enhances their Employability skills.
Course Code : 17300112	
Course Title: Computer Programming Lab	

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CO1	Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming
CO2	Acquire knowledge about the basic concept of writing a program.
CO3	Recognize constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
CO4	Use of conditional expressions and looping statements to solve problems Associated with conditions and repetitions.
CO5	Use functions involving the idea of modularity.
CO6	Construct structures and unions through which derived data types can be formed
CO7	Implement file handling for permanent storage of data or record.
Course Code : 17300113	
Course Title: Digital Logic Design Lab	
CO1	Describe the architecture of modern computer.
CO2	Analyze the Performance of a computer using performance equation
CO3	Calculate the effective address of an operand by addressing modes
CO4	Understand how a computer performs arithmetic operation of positive and negative numbers.
CO5	Understand how cache mapping occurs in computer and can solve various problems related to this Secondary storage organization and problem solving.

Course Outcomes for First Year Second Semester Course	
Course Code : 17300201	
Course Title: Data Structures	
CO1	Learn how to use data structure concepts for realistic problems.
CO2	Ability to identify appropriate data structure for solving computing problems in respective language
CO3	Ability to solve problems independently and think critically.
Course Code : 17300202	
Course Title: Computer Organization	
CO1	To apply the knowledge of performance metrics to find the performance of systems.
CO2	To create an assembly language program for a microprocessor system.
CO3	To design a hardware component for an embedded system
CO4	To deal with different types of computers
CO5	To identify high performance architecture design
Course Code : 17300203	
Course Title: OOPS Through Java	
CO1	Understand of the principles and practice of object oriented analysis and design in the construction of robust, maintainable programs.
CO2	Develop object oriented constructs such as various class hierarchies, interfaces & exception handling .

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CO3	Able to implement, compile, test and run Java programs comprising more than one class, to address a particular software problem.
CO4	Demonstrate the ability to use simple data structures like arrays in a Java program.
CO5	Make use of members of classes found in the Java API
CO6	Develop various types of selection constructs in a Java program.
CO7	Know about the creation of applets & using it and application oriented knowledge on swings.
Course Code : 17300204	
Course Title: Organizational Structures and Personnel Management	
CO1	Understand the importance of organizational structure and design on internal organizational.
CO2	Understand the relationships between organization structure and the behavior of those who work in them or otherwise interact with them.
CO3	Recognize the managerial implications of organization design and change and how these are informed by the relevant theories.
CO4	Appreciate the impact of advanced technologies on the strategy and structure of organizations and how to address the changes implied by the adoption of these technologies.
CO5	Understand the Personnel Functions like position of the personnel department in the organization
Course Code : 17300205	
Course Title: Intellectual Property Rights & Professional Ethics	
CO1	Understand intellectual property rights and trademarks
CO2	Model in different views in patent law and international patent law
CO3	Identify and analyze intellectual property rights and law of trademarks
CO4	Identify the infringement of different laws basing on ownership, transfers , duration, registration and searching
CO5	Know about the importance of software quality, social networking and ethical Issues .
Course Code : 17300211	
Course Title: DATA STRUCTURES LAB	
CO1	Identify the appropriate data structure for given problem.
CO2	Design and analyze the time and space complexity of algorithm or program.
CO3	Effectively use different data structures for solving real application problems.
Course Code : 17300212	
Course Title: OOPS Through Java Lab	
CO1	Write, compiling and execute basic Java program.
CO2	Know the use of data types and variables, decision control structures: if, nested if,etc.
CO3	Understand the use loop control structures: do, while, for etc.
CO4	Create classes and objects and use them in their program.
CO5	Know the use of OOP's concept i.e data abstraction, data hiding, encapsulation, Inheritance and polymorphism.
CO6	Create and use threads, handle exceptions and write applets.
CO7	Develop programs to create interfaces ,inner classes and wrapper classes.
Course Code : 17300213	

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Course Title: IT Workshop	
CO1	To know the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers.
CO2	Understand the hardware and software level trouble shooting process, tips and tricks.
CO3	Masters in working PC to disassemble and assemble to working condition and install Windows and Linux on the same PC.
CO4	Having awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks.
CO5	Design in crafting professional word documents; excel spread sheets and power point presentations using the Microsoft suite of office tools and Latex.
Course Outcomes for Second Year Third Semester Course	
Course Code : 17300301	
Course Title: Probability and Statistics with R	
CO1	Use of R programming for Statistical applications.
CO2	Understand the different data structures in R.
CO3	Use Sampling and find errors using R.
CO4	Acquaint with Graphics and Charts through R Programming,
CO5	Use ANOVA classification.
Course Code : 17300302	
Course Title: Data Base Management Systems	
CO1	Master the basics of SQL and construct queries using SQL.
CO2	Analyze the difference between traditional file system and DBMS.
CO3	Work with different data base languages.
CO4	Draw various data models for data base.
CO5	Be familiar with the relational database theory, and be able to write relational algebra expressions for queries.
CO6	Design schema and normalize data.
CO7	Understand how query are being processed and executed.
CO8	Deal with online transactions and control concurrency.
CO9	Work with indexing and sorting in disk files.
CO10	Understand types of data base failures and recovery.
Course Code : 17300303	
Course Title: Operations Research	

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CO1	Be proficient with tools from optimization, probability, statistics and simulation.
CO2	Understand engineering economic analysis, including fundamental applications.
CO3	Develop tools in industry and the public sector.
CO4	Facilitate mathematical and computational modelling of real decision-making problems.
CO5	Use modelling tools and computational tools.
CO6	Develop analytic skills to evaluate the problems.
CO7	Facilitate with the design, implementation, and analysis of computational experiments.
Course Code : 17300304	
Course Title: Computer Networks	
CO1	Independently understand basic computer network technology.
CO2	Identify the different types of network topologies and protocols.
CO3	Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.
CO4	Identify the different types of network devices and their functions within a network
CO5	Understand and building the skills of subletting and routing mechanisms.
CO6	Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.
CO7	Be familiar with wireless networking concepts
Course Code : 17300305	
Course Title: Design & Analysis of Algorithms	
CO1	Able to analyze and design algorithms and to appreciate the impact of algorithm design in practice.
CO2	Understand how the best, worst optimum case time complexity of an algorithm is defined
CO3	Know how a number of algorithms exists for fundamental problems in computer science and engineering work and compare with one another.
CO4	Know how asymptotic notation is used to provide a rough classification of algorithms
CO5	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
CO6	Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
Course Code : 17300311	
Course Title: Probability and Statistics with R Lab	
CO1	Applying concepts of data inputting and basic statistics in R
CO2	Implementing statistical modelling in R
CO3	Implementing various functions and programming in R

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Course Code : 17300312	
Course Title: Database Management Systems Lab	
CO1	Understand SQL Fundamentals.
CO2	Perform table operations.
CO3	Work with objects in databases.
CO4	Develop Table ,View, Log & Triggers.
CO5	Use PL/SQL for working with data
CO6	Develop Embedded and Nested Queries.
Course Code : 17300313	
Course Title: Python Programming Lab	
CO1	Design, create, build, and debug Python applications.
CO2	Write and apply decision and loop structures for different applications.
CO3	Write GUI based code for applications.
CO4	Write and apply procedures, sub-procedures, and functions to create manageable code.
CO5	Create one and two dimensional arrays for sorting, calculating, and displaying of data.
Course Outcomes for Second Year Forth Semester Course	
Course Code : 17300401	
Course Title: Operating Systems	
CO1	Understand the difference between different types of modern operating systems, virtual machines and their structure of implementation and applications.
CO2	Understand the concepts of deadlock in operating systems and how they can be managed / avoided and implement them in multiprogramming system.
CO3	Understand the design and management concepts along with issues and challenges of main memory, virtual memory and file system.
CO4	Relate master system resources sharing among the users
CO5	Master issues related to file system interface and implementation, Disk management
Course Code : 17300402	
Course Title: Web Technologies	
CO1	Understand XML and how to parse and use XML data with Java
CO2	Use the knowledge for developing web pages for different applications.
CO3	Identify with the need for and be able to write validated XHTML 1.0.
CO4	Apply sound, non-browser specific web design principles.
CO5	Use JavaScript to access the DOM to reference web document object CSS properties.
CO6	Understand and apply Java script, JSP, CSS & XHTML to create dynamic XHTML.
CO7	Be aware of emerging technologies and developing W3C recommendation.
Course Code : 17300403	
Course Title: Software Engineering	
CO1	Identify the minimum requirements for the development of application.
CO2	Develop, maintain, efficient, reliable and cost effective software solutions
CO3	Critically thinking and evaluate assumptions and arguments
CO4	Understand the process to be followed in the software development life cycle.
CO5	Analyze quality of software.
Course Code : 17300404	
Course Title: Cryptography & Network Security	
CO1	Design efficient secure algorithms for message communication.

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CO2	Masters in creation of digital signatures.
CO3	Awareness about Intruders and Hackers.
CO4	Knowledge about key generation , various attacks and viruses.
Course Code : 17300461A	
Course Title: Human Computer Interaction	
CO1	Design good user interface
CO2	Understand the requirements as a user.
CO3	Understand the usage of different software tools and interaction devices in user interface.
CO4	Understand the basic navigation tools and components in windows and their usage.
CO5	Understand interaction devices in user interface.
Course Code : 17300461B	
Course Title: Cloud Computing	
CO1	Understand the systems, protocols and mechanisms to support cloud computing.
CO2	Develop applications for cloud computing.
CO3	Understand the hardware necessary for cloud computing.
CO4	Design and implement a novel cloud computing application.
CO5	Handle the security features in cloud computing.
Course Code : 17300461C	
Course Title: Mobile Computing	
CO1	Explain the basics of mobile telecommunication system
CO2	Choose the required functionality at each layer for given application
CO3	Identify solution for each functionality at each layer
CO4	Use simulator tools and design Ad hoc networks
CO5	Develop a mobile application.
Course Code : 17300411	
Course Title: OPERATING SYSTEMS LAB	
CO1	Use Unix utilities and perform basic shell control of the utilities
CO2	Use the Unix file system and file access control.
CO3	Use of an operating system to develop software
CO4	Use Linux environment efficiently
CO5	Solve problems using bash for shell scripting
Course Code : 17300412	
Course Title: Web Technologies Lab	
CO1	Design and implement a basic website.
CO2	Implement different navigation strategies.
CO3	Use client-side technologies (XHTML, CSS, forms, JavaScript, and
CO4	Use server-side technologies (Servlets and JSP) to implement websites.
CO5	Develop simple back-end database to support a website.
CO6	Recognize and evaluate website organizational structure and design elements.
CO7	Create XML applications.
Course Code : 17300421	

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Course Title: Mini Project	
CO1	Gain practical experience of working on real applications
CO2	Apply the concepts learned by them in various subjects.
CO3	Gain experience of working as a team or group.
CO4	Understand the importance of planning and designing in application design.
Course Outcomes for Third Year Fifth Semester Course	
Course Code : 17300501	
Course Title: Data Warehousing and Data Mining	
CO1	Understand why the data warehouse in addition to traditional database systems.
CO2	Perform the pre-processing of data and apply mining techniques on it.
CO3	Identify the association rules, classification and clusters in large data sets.
CO4	Solve real world problems in business .
CO5	Solve real world problems scientific information using data mining.
Course Code : 17300502	
Course Title: OOAD through UML	
CO1	Analyse the case studies.
CO2	Model in different views with respect user requirement.
CO3	Designing use case, logical, component and deployment.
CO4	Prepare document of any project.
CO5	Model a real world application by using ER-Diagrams.
Course Code : 17300503	
Course Title: Computer Graphics and Multimedia Systems	
CO1	solve a wide range of graphic design problems.
CO2	Interactive experiences for a wide range of audiences.
CO3	Use various software programs used in the creation and implementation of multi-media (interactive, motion/animation, presentation, etc.).
CO4	Known relationship between critical analysis and the practical application of design.
CO5	Develop issues related to emerging electronic technologies and graphic design.
Course Code : 17300562A	
Course Title: Software Project Management	
CO1	Capable to determine the purpose and importance of project management from the Perspectives of planning, tracking and completion of project.
CO2	Compare and differentiate organization structures and project structures.
CO3	Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.
Course Code : 17300562B	
Course Title: Data Science	
CO1	Apply fundamental algorithmic ideas to process data.
CO2	Leverage algorithmic insights in order to design novel data science algorithms.
CO3	Develop a solid background on foundations of data science algorithms.
CO4	Determine running times for common algorithms that process large-scale data.
CO5	Usage of terminology related to data science.
Course Code : 17300562C	
Course Title: Mobile Application Development	
CO1	Design, implement and evaluate a User Interface for a mobile application using J2ME.

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CO2	Create a small but realistic working mobile application for small computing devices.
CO3	Categorize the challenges posed by developing mobile applications and be able to Propose and evaluate and select appropriate solutions.
CO4	Install and configure Android application development tools.
CO5	Design and develop user Interfaces for the Android platform.
CO6	Save state information across important operating system events.
Course Code : 17300562D	
Course Title: Machine learning	
CO1	Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
CO2	Discuss the decision tree algorithm and indentity and overcome the problem of Overfitting
CO3	Discuss and apply the back propagation algorithm and genetic algorithms to various problems
CO4	Apply the Bayesian concepts to machine learning
CO5	Analyse and suggest appropriate machine learning approaches for various types of problems
Course Code : 17300563A	
Course Title: Software Testing Methodologies	
CO1	Apply software testing knowledge and engineering methods.
CO2	Design and conduct a software test process for a software testing project.
CO3	Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.
CO4	Use software testing methods and modern software testing tools for their testing projects.
Course Code : 17300563B	
Course Title: Artificial Intelligence	
CO1	Identify the problems that are amenable to solution by AI methods.
CO2	Identifying appropriate AI methods to solve a given problem.
CO3	Formalize a given problem in the language/framework of different AI methods.
CO4	Implementing basic AI algorithms.
CO5	Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.
Course Code : 17300563C	
Course Title: E-Commerce	
CO1	Understand modern computing infrastructures from the perspective of the internet and Organizations.
CO2	Having ability to solve theoretical and practical issues of conducting business over the internet and the Web
CO3	Reflect on general principles revealed through practical exploration of specific tools, techniques and methods in e-business.
Course Code : 17300511	
Course Title: Data Warehousing And Data Mining Lab	
CO1	Apply data mining techniques in real applications.
CO2	Decision on which concepts to be used and how to be used in applications.
CO3	Design a Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment.

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CO4	Design a data warehouse or data mart to present information needed by management in a form that is usable for management client.
Course Code : 17300512	
Course Title: OOAD through UML Lab	
CO1	Understand the Case studies and design the Model.
CO2	Understand how design patterns solve design problems.
CO3	Develop design solutions using creational patterns.
CO4	Construct design solutions by using structural and behavioral patterns.
CO5	Able to construct UML diagrams for static view and dynamic view of the system.
CO6	Model creational patterns by applicable patterns for given context.
CO7	Create refined model for given Scenario using structural patterns.
CO8	Able to construct behavioural patterns for given applications.
Course Outcomes for Third Year Sixth Semester Course	
Course Code : 17300601	
Course Title: BIG DATA ANALYTICS	
CO1	Understand how to leverage the insights from big data analytics
CO2	Analyze data by utilizing various statistical and data mining approaches
CO3	Perform analytics on real-time streaming data
CO4	Understand the various No SQL alternative database models
Course Code : 17300611	
Course Title: BIG DATA ANALYTICS LAB	
CO1	Able to install Pig, Hive, SPARK and configure Hadoop and HDFS
CO2	Process big data using Hadoop framework
CO3	Understand R programming basics.
CO4	Build and apply linear and logistic regression models
CO5	Perform data analysis with machine learning methods

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CO-4	To understand the concept of equalizers and types.
CO-5	To provide knowledge about wireless networks.

Course code:17241261(A)	
Course Title: CMOS ANALOG AND DIGITAL IC DESIGN	
CO-1	To provide knowledge about MOS design and small signal modelling of MOS devices.
CO-2	To get knowledge on both combinational and sequential MOS device modelling circuits.
CO-3	Underlying the concept dynamic logic circuits.
CO-4	To provide knowledge about semiconductor memories.
CO-5	To understand the concept of Analog CMOS Sub- circuits.
Course code:17241211	
Course Title: ADVANCED COMMUNICATIONS LAB	
CO-1	To understand the communications.
CO-2	To get knowledge on advanced level of communications.
CO-3	Underlying the concept dynamic communications
CO-4	To provide knowledge about advanced communications.
CO-5	To understand the concept of communications in advanced levels.

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CO4	Design a data warehouse or data mart to present information needed by management in a form that is usable for management client.
Course Code : 17300512	
Course Title: OOAD through UML Lab	
CO1	Understand the Case studies and design the Model.
CO2	Understand how design patterns solve design problems.
CO3	Develop design solutions using creational patterns.
CO4	Construct design solutions by using structural and behavioral patterns.
CO5	Able to construct UML diagrams for static view and dynamic view of the system.
CO6	Model creational patterns by applicable patterns for given context.
CO7	Create refined model for given Scenario using structural patterns.
CO8	Able to construct behavioural patterns for given applications.
Course Outcomes for Third Year Sixth Semester Course	
Course Code : 17300601	
Course Title: BIG DATA ANALYTICS	
CO1	Understand how to leverage the insights from big data analytics
CO2	Analyze data by utilizing various statistical and data mining approaches
CO3	Perform analytics on real-time streaming data
CO4	Understand the various No SQL alternative database models
Course Code : 17300611	
Course Title: BIG DATA ANALYTICS LAB	
CO1	Able to install Pig, Hive, SPARK and configure Hadoop and HDFS
CO2	Process big data using Hadoop framework
CO3	Understand R programming basics.
CO4	Build and apply linear and logistic regression models
CO5	Perform data analysis with machine learning methods

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CO-4	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.
Course Code: 14199202	
Course Title: Mathematics – III	
CO-1	Solve problems in engineering domain related to Linear Algebra using matrices.
CO-2	Analyze and solve engineering problems using Laplace Series.
CO-3	Analyze and solve engineering problems using Fourier Series.
CO-4	Solve engineering problems using Complex Integration
Course code: 14199206	
Course Name: Environmental Studies	
CO-1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO-2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO-3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO-4	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO-5	Influence their society in proper utilization of goods and services.
Course code: 14199211	
Course Name: English Communication Skills Lab-II	
CO-1	Communicate confidently in English in social and professional contexts with improved skills of fluency and accuracy
CO-2	Speak grammatically correct sentences employing appropriate vocabulary suitable to different contexts
CO-3	Read for various scholarly materials for information and comprehension
Course code: 14199212	
Course Name: Engineering Physics Lab	
CO-1	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics
CO-2	To interpret dielectric loss, Lorentz field and Claussius - Mosotti relation and classify the magnetic materials based on susceptibility and their temperature dependence. To apply the Gauss' Theorem for divergence and Stokes' Theorem for curl and evaluate Maxwell's displacement current and correction in Ampere's law.
CO-3	To assess the electromagnetic wave propagation in different media and its power and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors.
CO-4	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.

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1.1.1: Curricula developed and implemented have relevance to the local, regional, national, and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes(COs) of the Programmes offered by the institution



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PEOs, PSOs & COs

GR-14 B.Tech (Civil Engineering)

Department Vision:

To be the best Civil Engineering department in the region by means of good teaching, research and consultancy that serves the society.

Department Mission:

- Arranging field visits, guest lectures and interactive sessions with subject experts
- Creating a strong bond between industrial needs and academic research outcomes
- Undertaking collaborative projects which offer opportunities for long-term interaction between academia and industry
- Promoting the career of the faculty members by encouraging their research work
- Adopting best teaching practices, imparting employability skills and empowering to become entrepreneurs in the trade.

Program Educational Objectives (PEOs):

PEO1	Learning new technologies and/or undertaking higher education.
PEO2	Leading a team of engineers in executing projects.
PEO3	An entrepreneur in civil engineering community and/or a leadership role exhibiting systematic approach to resolve societal problems with ethical values.

Program Educational Objectives (PSOs):

PSOs	• PSO1: Get proficiency in management and communication skills to become an entrepreneur. • PSO2: Ability to use earth sciences in execution of civil engineering projects.

Program Outcomes (POs): Engineering Graduates will be able to:

- PO-1. Apply knowledge of computing, mathematics, science and engineering basics related to Civil Engineering.
- PO-2. Identify the problems and analyse the solutions by simulating, conducting experiments and interpreting data.
- PO-3 Design civil engineering structures to meet industrial needs.
- PO-4 Explore and investigate contemporary engineering problems and proposed solutions.
- PO-5 Use latest techniques, skills and modern machinery for engineering practices.
- PO-6 Propose civil engineering solutions to solve societal problems.
- PO-7 Design sustainable systems in congruence with social and environmental issues.
- PO-8 Practice professional ethics with legal awareness and societal responsibilities.
- PO-9 Work as an individual or in a team to achieve targets.
- PO-10 Articulate thoughts and ideas effectively at different levels.
- PO-11 Manage financial and human resources for better execution of project.
- PO-12 Participate in lifelong learning process.

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Course outcomes for First Year First Semester Course	
Course Code:14198101	
Course Title: English - I	
CO1:	Understand doing self-introspection and self-vigilance
CO2:	Achieve high quality of life, strength and sovereignty of a developed nation
CO3:	Understand the importance of writing skills and its techniques
CO4:	Envision the dangers of scientific and technological innovations
CO5:	Improve the exposure to universal happenings
CO6:	Communicate the necessity to exercise humour in the daily life
Course Code:14198201	
Course Title: English - II	
CO1:	Understand the proposed technology is people's technology and its service to the humanity instead of
CO2:	Understand that climate must be preserved
CO3:	Adopt the applications of modern technologies such as nano technology.
CO4:	Understand that water is the elixir of life
CO5:	Learn to work hard with devotion and dedication.
CO6:	Understand the advantages of work. They will overcome their personal problems and address
Course Code:14198102	
Course Title: Mathematics – I (Differential Equations)	
CO1:	Solve first and higher order ordinary differential equations(ODE) with applications by various techniques
CO2:	Apply Laplace Transforms to solve Initial Value Problems and evaluate Infinite Integrals.
CO3:	Apply Partial Differentiation to solve Inequalities and to find Maxima and Minima.
CO4:	Solve First and Higher order PDE with their applications to Heat equation, Wave equation, Laplace
Course Code:14198103	
Course Title: Mathematics – II (Numerical Methods and Integral Transforms)	
CO1:	Apply Numerical Techniques to solve Algebraic and Transcendental Equations and also Initial Value
CO2:	To interpolate the tabulated data at the given values using various interpolation techniques.
CO3:	Express a given function satisfying certain conditions in Fourier Series.
CO4:	Use finite and infinite Fourier Integral Transforms to solve BVPs
CO5:	Solve Difference Equations using Z-Transforms.
Course Code:14198202	
Course Title: Mathematics – III (Linear Algebra & Vector Calculus)	
CO1:	Use matrix theory to solve linear system of equations
CO2:	Find eigen values and Eigen vectors and use Cayley Hamilton theorem to find Inverse and Powers of a
CO3:	Learn applications of Integration and evaluation of Multiple Integrals.
CO4:	Use Beta, Gamma functions to evaluate Improper Integrals.
Course Code:14198104	
Course Title: Engineering Physics	
CO1:	Understand applications of optics using basic fundamentals of physics
CO2:	Explain the Modern Physics Concepts
CO3:	Familiar with basic elements of Quantum Theory
CO4:	knowledge about dual nature of wave function, Applications of Schrodinger wave equation Fermi-Dirac
CO5:	Identify the appropriate solid state materials for engineering applications
CO6:	formulate and solve the engineering problems on light and optics, Electromagnetism, wave mechanics
CO7:	Correlate Advanced Topics in Physics with Engineering Applications
CO8:	Get acquainted with Current Trends in Physics

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Course Code:	
Course Title: Engineering Physics Laboratory	
CO1:	Understand the techniques of interference and diffraction experimentally.
CO2:	Understand the resistance dependence on temperature for thermist or and to apply the experimental
CO3:	Enables to understand the velocity of sound and modes of propagation.
CO4:	Determination of Hall coefficient experimentally and knowledge about semiconductors
CO5:	Experimental knowledge on electricity and magnetism
CO6:	Understand the basics of Mechanics experimentally.
Course Code:14198112	
Course Title: Engineering Chemistry	
CO1:	Compare and contrast the chemical behaviour and physical properties of common substances.
CO2:	Understand the conventional and modern methods of processing of water for industrial and domestic
CO3:	Estimate the mixture of constituents present in industrial waste using conductometric and potentiometric titrations
CO4:	Classification of corrosion and factors effecting corrosion.
CO5:	Study the production and utility of polymers.
CO6:	Define a fuel and classify them on the basis of their physical state.
CO7:	Perform laboratory experiments that illustrate basic chemical principles
Course Code:14198212	
Course Title: Engineering Chemistry Laboratory	
CO1:	Experiment volumetric analysis and titrations with different indicators
CO2:	Analyse a few instrumental methods of chemical analysis
CO3:	Demonstrate different methods of chemical analysis and use of some commonly employed instruments.

GR-14 B.Tech Electrical & Electronic Engineering

Department Vision:

To be a pioneering department in preparing students to compete globally in their profession and making significant contribution to the society.

Department Mission:

- Establishing centers of excellence with focus on advancedtechnology
- By preparing the students for successful careers based on a strong normalethical foundation
- Delivering world class teaching, mentoring, intellectual stimulation, industry collaborations and state of the art research
- By training and educating students as global citizens to become entrepreneursin their chosen field

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Program Educational Objectives (PEOs):

PEO1	Engage in ongoing learning and professional development throughself- study, continuing education in Electrical and Electronics Engineering and also in other allied fields
PEO2	Apply their engineering skills, exhibiting critical thinking and problem solving skills in professional engineering practices or tacklesocial, technical and business challenges
PEO3	Improve professional competence through lifelong learn inincluding higher education and research

Program Specific Outcomes (PSO's):

PSO1	Apply knowledge of power system configuration, electrical equipmentand protection practices to the design and specifications of electrical generation, transmission, distribution and utilization systems
PSO2	To design. Analyze, test and evaluate the performance of theelectrical machines and transformers
PSO3	To develop the expertise in the technology associated with efficient conversion and control of electrical power by static means fromavailable forms to the required form
PSO4	Graduates will able to work as research fellow and implement theirknowledge in all electrical and electronics research organization of defense, renewable energy, mines, chemical and power plants

Program Outcomes (POs): Engineering Graduates will beable to:

1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complexengineering problems.
2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problemsand design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, andmodern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledgeto assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate theknowledge of, and need for sustain able development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a memberor leader in diverse teams, and in multidisciplinary settings.

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10	**Communication:** Communicate effectively on complex engineering activities with theengineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of theengineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinaryenvironments.
12	**Life-long learning:** Recognize the need for, and have the preparation and abilityto engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes for First Year First SemesterCourse	
Course Code: 14199102	
Course Title: Mathematics-I	
CO-1	Solve first and higher order ordinary differential equations (ODE) with applications byvarious techniques
CO-2	Apply Laplace Transforms to solve Initial Value Problems and evaluate InfiniteIntegrals
CO-3	Apply Partial Differentiation to solve Inequalities and to find maxima and minima
CO-4	Solve first and higher order PDE with their applications to Heat equation, waveequation, Laplace equation
Course Code: 14199101	
Course Title: English-I	
CO-1	Take inspiration by reading autobiographies
CO-2	Aspire for the useful innovations to improve living
CO-3	Help the common man and achieve the social cause
CO-4	Achieve the target without compromise
Course Code: 14199104	
Course Title: Applied Mechanics	
CO-1	Summaries the behavior of basic materials under the influence of different external
CO-2	Determine shear Force and Bending moments in statically determinate Beams and draw theDiagrams.
CO-3	Examine the different methods to find slope and deflection of beams subjected to loads
CO-4	Estimate the principal stresses & strains and torsional stresses in structural members
Course Code: 14199191	
Course Title: Professional Ethics & Human Values	
CO-1	Understood the core values that shape the ethical behavior of an engineer
CO-2	Exposed awareness on professional ethics and human values
CO-3	Known their role in technological development
CO-4	knowledge of contemporary issues related to human and professional Interactions atworkplace which helps students to understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature
Course Code: 14199103	
Course Title: Computer Programming	

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CO-1	Obtain the knowledge about different languages used in computer programming
CO-2	Write algorithm. Flow chart, and structure of C program and make use of different C tokens
CO-3	Develop program by using control structure , different looping and Jump statements
CO-4	Implement applications of Array, structure and String inside the program
Course Code: 14199181	
Course Title: Engineering Workshop & IT Workshop	
CO-1	Explain the limitations, tolerances, safety aspects of electrical systems & wiring.
CO-2	Select wires/cables and other accessories used in different types of wiring
CO-3	Make simple lighting and power circuits
CO-4	Make disassembling and assembling of PC.
Course Code: 14199111	
Course Title: English Communication Lab I	
CO-1	Learn to communicate in English
CO-2	Comprehend native speaker's accent
CO-3	Speak appropriately in real life situations
CO-4	Display public speaking skills in the required context
Course Code: 14199112	
Course Title: Computer Programming Lab	
CO-1	Obtain the knowledge about different languages used in computer programming
CO-2	Write algorithm. Flow chart, and structure of C program and make use of different C tokens
CO-3	Develop program by using control structure , different looping and Jump statements
CO-4	Implement applications of Array, structure and String inside the program
Course Code : 14199105	
Course Title : Basic Engineering Drawing	
CO-1	Apply principles of drawing to represent dimensions of an object
CO-2	Outline the Polygons and engineering curves
CO-3	Illustrate projections of points, lines, plane and solids
CO-4	Illustrate 3D views through isometric views
Course Outcomes for First Year Second Semester Course	
Course Code: 14199203	
Course Title: Mathematics-II	
CO-1	Apply numerical techniques to solve algebraic and transcendental equations and also initial value problems and ODE
CO-2	To interpolate the tabulated data at the given values using various interpolation techniques
CO-3	Express a given function satisfying certain conditions in Fourier series
CO-4	Use finite and infinite Fourier Integral Transforms to solve BVPs
Course Code: 14199204	
Course Title: Engineering Physics	
CO-1	Understand applications of optics using basic fundamentals of Physics

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CO-2	Explain the Modern Physics Concepts
CO-3	Familiar with Basic Elements of Quantum Theory
CO-4	knowledge about dual nature of wave function, Applications of Schrodinger waveequation Fermi-Dirac probability function
Course Code: 14199201	
Course Title: English-II	
CO-1	Be inspired by Bose's achievements so that he may start his own original work
CO-2	Be inspired by Bhabha's achievements so as to make his own experiments
CO-3	Realize that development is impossible without scientific research
CO-4	Appreciate the art of writing a short story and try his hand at it.
Course Code: 14199202	
Course Title: Mathematics – III	
CO-1	Use matrix theory to solve linear system of equations
CO-2	Find eigen values and Eigen vectors and use Cayley Hamilton theorem to find Inverse and Powers of a Matrix and also reduce a given Quadratic form to Canonical form
CO-3	Learn applications of Integration and evaluation of Multiple Integrals
CO-4	Use Beta, Gamma functions to evaluate Improper Integrals
Course code : 14199212	
Course Title: Engineering Physics Laboratory	
CO-1	To handle optical instruments like microscope and spectrometer
CO-2	To demonstrate the importance of dielectric material in storage of electric field energyin capacitors
CO-3	To evaluate the resistivity of the given semiconductor using probe method
CO-4	To identify the type of semi-conductor
Course Code: 14199206	
Course Title: Environmental Studies	
CO-1	Gain a higher level of personal involvement and interest in understanding and solvingenvironmental problems
CO-2	Comprehend environmental problems from multiple perspectives with emphasis on human modern life styles and developmental activities
CO-3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of 21st century
CO-4	Recognize the interconnectedness of human dependence on the earth's eco system
Course Code: 14199211	
Course Title: English Communicative English Laboratory II	
CO-1	Learn to communicate in English
CO-2	Comprehend native speaker's accent
CO-3	Speak appropriately in real life situations
CO-4	Display public speaking skills in the required context
Course Code : 14199205	
Course Title : Advanced computer programming	
CO-1	Obtain the knowledge about different languages used in computer programming
CO-2	Write algorithm. Flow chart, and structure of C program and make use of different C tokens

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CO-3	Develop program by using control structure , different looping and Jump statements
CO-4	Implement applications of Array, structure and String inside the program
Course Code : 14199213	
Course Title : Advanced computer programming Lab	
CO-1	Obtain the knowledge about different languages used in computer programming
CO-2	Write algorithm. Flow chart, and structure of C program and make use of different C tokens
CO-3	Develop program by using control structure , different looping and Jump statements
CO-4	Implement applications of Array, structure and String inside the program

GR-14 B.Tech (Mechanical Engineering)

Department Vision: To be recognized as a Global Centre of Excellence in Mechanical Engineering Education, Research and Consultancy

Department Mission: Department of Mechanical Engineering strives to provide scope for all round development of the students and staff by engaging them in various activities such as

- Participative learning so that students internalize their classroom learning practices.
- Student centric learning practices such as summary sessions, learn-ahead-of class, problem solving.
- Extensive practical courses to foster learning by observation.
- Exposing students, faculty and staff to various industrial practices and usage of modern tools to reinforce their classroom/laboratory learning.
- Sensitization towards importance of ethical practice, societal responsibility, leadership skills, entrepreneurship skills, communication skills and lifelong learning.

Program Educational Objectives (PEOs):

PEO1	Working professional in Mechanical Engineering field or other disciplines to develop products, processes to solve Mechanical Engineering related or other problems for betterment of society.
PEO2	Pursuing further education to enrich their knowledge in Mechanical Engineering or other fields.
PEO3	Undertaking entrepreneurial ventures in Mechanical Engineering or other disciplines.

Program Specific Outcomes (PSO's):

PSO1	Join a technically sophisticated workforce as successful professionals in a wide range of mechanical engineering and related fields.
PSO2	Continuously improve and expand their technical and professional skills through formal means as well as through informal self-study.
PSO3	Pursue advanced degrees in engineering, business, or other professional fields.
PSO4	Advance themselves professionally and personally by accepting professional and social responsibilities and pursuing leadership roles.

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Program Outcomes (POs): Engineering Graduates will be able to:

1	Apply fundamental knowledge of Science, Mathematics and Engineering principles in solving problems related to Mechanical Engineering.
2	Apply principles of design engineering, thermal engineering, production engineering and industrial engineering to arrive at a physically meaningful analysis of engineering problems.
3	Present feasible designs for simple domestic and industrial Mechanical Engineering problems through drawings and other multimedia tools to meet desired needs.
4	Identify, formulate and solve Mechanical engineering problems through rigorous research methodology.
5	Use Drafting, Modeling and Analysis Software and/or hardware tools for meaningful and economically viable Engineering practice.
6	Apply knowledge of Thermal, Design, Automation Technologies and Management principles to inter-disciplinary engineering problems and their societal implications.
7	Understand and propose, where ever possible, environment-friendly and sustainable solutions to Mechanical Engineering problems.
8	Expertise in following ethical code of conduct in professional activities.
9	Use their analytical, teamwork, leadership skills in the development of products and provide solutions to problems sought by local and/or global community.
10	Communicate verbally, textually and graphically to collaborate effectively towards engineering activities
11	Inspire confidence in team members to realize the goals of the organization and manage finances an sizeable projects by choosing the right blend of common sense solutions.
12	Develop confidence and a sense of curiosity towards life-long learning to adapt to ever changing technologies.

Course outcomes for First Year First Semester Course	
Course Code:14198101	
Course Title: English-I	
CO1:	Understand doing self introspection and self vigilance
CO2:	Achieve high quality of life, strength and sovereignty of a developed nation
CO3:	Understand the importance of writing skills and its techniques
CO4:	Envision the dangers of scientific and technological innovations
CO5:	Improve the exposure to universal happenings
CO6:	Communicate the necessity to exercise humour in the daily life
Course Code: 14198102	
Course Title: Mathematics – I	
CO1:	Solve first and higher order ordinary differential equations(ODE) with applications by various techniques.
CO2:	Apply Laplace Transforms to solve Initial Value Problems and evaluate Infinite Integrals.
CO3:	Apply Partial Differentiation to solve Inequalities and to find Maxima and Minima.
CO4:	Solve First and Higher order PDE with their applications to Heat equation, Wave equation, Laplace equation
Course Code: 14198103	
Course Title: Mathematics – II	
CO1:	Apply Numerical Techniques to solve Algebraic and Transcendental Equations and also Initial Value Problems and ODE.
CO2:	To interpolate the tabulated data at the given values using various interpolation techniques.
CO3:	Express a given function satisfying certain conditions in Fourier Series.
CO4:	Use finite and infinite Fourier Integral Transforms to solve BVPs.

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CO5:	Solve Difference Equations using Z-Transforms.
Course Code : 14198103	
Course Title: Engineering Physics	
CO1:	Understand applications of optics using basic fundamentals of Physics
CO2:	Explain the Modern Physics Concepts
CO3:	Familiar with Basic Elements of Quantum Theory
CO4:	Knowledge about dual nature of wave function, Applications of Schrodinger wave equation Fermi-Dirac probability function, Position of Fermi level in intrinsic and extrinsic semiconductors, Semiconductor conductivity
CO5:	Identify the appropriate solid state materials for engineering applications
CO6:	Formulate and solve the engineering problems on light and optics, Electromagnetism, wave mechanics
CO7:	Correlate Advanced Topics in Physics with Engineering Applications
CO8:	Get acquainted with Current Trends in Physics
Course Code: 14198106	
Course Title: Environmental Studies	
CO1:	Demonstrate a scientific understanding of the physical and biological dynamics of global ecologies including first-hand knowledge of local and regional ecosystems
CO2:	Analyze the social, economic, and political and policy dynamics involved in both the emergence and the resolution of environmental problems
CO3:	Explain and analyze the historical development, ethical implications, and religious dimensions of the human relationship with the nonhuman world
CO4:	Understand the complex relationships between natural and human systems.
CO5:	Understand Industrial designs must be correlate with the government rules and policies.
Course outcomes for First Year Second Semester Course	
Course Code: 14198201	
Course Title: English – II	
CO1:	Understand the proposed technology is people's technology and its service to the humanity instead of making them servant of machines.
CO2:	Understand that climate must be preserved
CO3:	Adopt the applications of modern technologies such as nanotechnology.
CO4:	Understand that water is the elixir of life
CO5:	Learn to work hard with devotion and dedication.
CO6:	Understand the advantages of work. They will overcome their personal problems and address themselves to national and other problems.
Course Code: 14198202	
Course Title: Mathematics –III	
CO1:	Use matrix theory to solve linear system of equations
CO2:	Find eigen values and Eigen vectors and use Cayley Hamilton theorem to find Inverse and Powers of a Matrix and also reduce a given Quadratic form to Canonical form.
CO3:	Learn applications of Integration and evaluation of Multiple Integrals.
CO4:	Use Beta, Gamma functions to evaluate Improper Integrals.
CO5:	Use vector differentiation and integration with vector integral theorems
Course Code: 14198203	
Course Title: Engineering Chemistry	
CO1:	Compare and contrast the chemical behaviour and physical properties of common substances.
CO2:	Understand the conventional and modern methods of processing of water for industrial and domestic use.
CO3:	Estimate the mixture of constituents present in industrial waste using conductometric and potentiometric titrations

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CO4:	Classification of corrosion and factors effecting corrosion.
CO5:	Study the production and utility of polymers.
CO6:	Define a fuel and classify them on the basis of their physical state.
CO7:	Perform laboratory experiments that illustrate basic chemical principles
Course Code: 14198291	
Course Title: Professional Ethics and Human Values	
CO1:	Understood the core values that shape the ethical behaviour of an engineer
CO2:	Exposed awareness on professional ethics and human values.
CO3:	Known their role in technological development.
CO4:	A knowledge of contemporary issues related to human and professional
CO5:	Interactions at workplace which helps students to understand practically the importance of trust, mutually satisfying human behaviour and enriching interaction with nature
Course Code: 14198211	
Course Title: English Communication Skills Lab-II	
CO1:	Understand the benefits of learning kinesics
CO2:	Make the social life comfortable with conversational ability
CO3:	Adopt employability skills
CO4:	Develop coordinating skills
CO5:	Exhibit good argumentative skills
CO3:	Speak appropriately in real life situations
CO4:	Display public speaking skills in the required context
CO5:	Handle different communicative situations

GR-14 B.Tech (Electronics & Communication Engineering)

Department Vision:

Create an educational environment to mound the students to meet the challenges of modern Electronics & Communication industry through state of the art Technical knowledge and Innovative experimental Approaches.

Department Mission:

- To create learning, development and testing environment to meet ever challenging needs of the Electronic industry
- TocreateentrepreneurialenvironmentandindustryInteractionforMutualbenefit
- To become a global partner in training human resources in the fields of chip design, instrumentation and networking
- To associate with internationally reputed Institutions for Academic excellence and collaborative Research

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Program Educational Objectives (PEOs):

PEO1	To prepare students with excellent comprehension of basic Sciences, mathematics and engineering subjects facilitating them to gain employment or pursue postgraduate studies with an appreciation for lifelong learning.
PEO2	To train students with problem solving capabilities such as analysis and design with adequate practical skills wherein they demonstrate creativity and innovation that would enable them to develop state of the art equipment and technologies of multidisciplinary nature for societal development.

Program Specific Outcomes (PSO's):

PSO1	Analyze and design analog and digital circuits or systems for a given specification and function
PSO2	Implement functional blocks of hardware-software co-designs for signal processing and communication applications.

Program Outcomes (POs): Engineering Graduates will be able to:

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

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Course outcomes (Cos) o fall courses of all programs offered by the institution

Course Outcomes for First Year First Semester Course	
Course Code:14199101	
Course Title: ENGLISH –I	
CO-1	The learner will understand how Gandhi grew in introspection and maturity.
CO-2	The learners will achieve a higher quality of life, strength and sovereignty of a developed nation.
CO-3	This develops in the student the scientific attitude to solve many problems which we find difficult to tackle.
CO-4	The learner will be able to think clearly and logically and write clearly and logically.
CO-5	The learner will understand that all men can come together and avert the peril.
CO-6	This provides the students to think about the scientific phenomena from a different angle and also exposes the readers to poetic expressions.
Course Code:14199102	
Course Title: Mathematics – I	
CO-1	Transform the knowledge of solving system of linear equations using matrices.
CO-2	Apply mean value Rolls, Lagranges and Cauchy mean value theorem in engineering applications
CO-3	Acquire the knowledge maxima and minima of function of several variables
CO-4	Evaluate multiple integrals and their applications
CO-5	Understand Beta and Gamma functions, evaluate improper integrals
Course code: 14199111	
Course Title: English Communication Skills Lab-I	
CO-1	Paraphrase short academic texts using suitable strategies and conventions
CO-2	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
CO-3	Build the ability to convey in different communicative forms.
Course Outcomes for First Year Second Semester Course	
Course Code: 14199201	
Course Title: ENGLISH –II	
CO-1	Paraphrase short academic texts using suitable strategies and conventions
CO-2	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
CO-3	Build the ability to convey in different communicative forms
Course code: 14199204	
Course Title: Engineering Physics	
CO-1	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics
CO-2	To interpret dielectric loss, Lorentz field and Claussius- Mosotti relation and classify the magnetic materials based on susceptibility and their temperature dependence. To apply the Gauss' Theorem for divergence and Stokes' Theorem for curl and evaluate Maxwell's displacement current and correction in Ampere's law.
CO-3	To assess the electromagnetic wave propagation in different media and its power and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors

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CO-4	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.
Course Code: 14199202	
Course Title: Mathematics – III	
CO-1	Solve problems in engineering domain related to Linear Algebra using matrices.
CO-2	Analyze and solve engineering problems using Laplace Series.
CO-3	Analyze and solve engineering problems using Fourier Series.
CO-4	Solve engineering problems using Complex Integration
Course code: 14199206	
Course Name: Environmental Studies	
CO-1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO-2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO-3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO-4	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO-5	Influence their society in proper utilization of goods and services.
Course code: 14199211	
Course Name: English Communication Skills Lab-II	
CO-1	Communicate confidently in English in social and professional contexts with improved skills of fluency and accuracy
CO-2	Speak grammatically correct sentences employing appropriate vocabulary suitable to different contexts
CO-3	Read for various scholarly materials for information and comprehension
Course code: 14199212	
Course Name: Engineering Physics Lab	
CO-1	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics
CO-2	To interpret dielectric loss, Lorentz field and Claussius - Mosotti relation and classify the magnetic materials based on susceptibility and their temperature dependence. To apply the Gauss' Theorem for divergence and Stokes' Theorem for curl and evaluate Maxwell's displacement current and correction in Ampere's law.
CO-3	To assess the electromagnetic wave propagation in different media and its power and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors.
CO-4	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.

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CO-4	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.
Course Code: 14199202	
Course Title: Mathematics – III	
CO-1	Solve problems in engineering domain related to Linear Algebra using matrices.
CO-2	Analyze and solve engineering problems using Laplace Series.
CO-3	Analyze and solve engineering problems using Fourier Series.
CO-4	Solve engineering problems using Complex Integration
Course code: 14199206	
Course Name: Environmental Studies	
CO-1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO-2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities
CO-3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO-4	Recognize the interconnectedness of human dependence on the earth's ecosystems
CO-5	Influence their society in proper utilization of goods and services.
Course code: 14199211	
Course Name: English Communication Skills Lab-II	
CO-1	Communicate confidently in English in social and professional contexts with improved skills of fluency and accuracy
CO-2	Speak grammatically correct sentences employing appropriate vocabulary suitable to different contexts
CO-3	Read for various scholarly materials for information and comprehension
Course code: 14199212	
Course Name: Engineering Physics Lab	
CO-1	To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics
CO-2	To interpret dielectric loss, Lorentz field and Claussius - Mosotti relation and classify the magnetic materials based on susceptibility and their temperature dependence. To apply the Gauss' Theorem for divergence and Stokes' Theorem for curl and evaluate Maxwell's displacement current and correction in Ampere's law.
CO-3	To assess the electromagnetic wave propagation in different media and its power and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors.
CO-4	To study the basic Quantum mechanics, interpretation of the direct and indirect band gap in semiconductors and identify the type of semiconductor using Hall effect.

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1.1.1: Curricula developed and implemented have relevance to the local, regional, national, and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes(COs) of the Programmes offered by the institution



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PEOs, PSOs & COs

GRMT-20 M.Tech Civil Engineering

Department Vision:

To be the best Civil Engineering department in the region by means of good teaching, research and consultancy that serves the society.

Department Mission:

- Arranging field visits, guest lectures and interactive sessions with subject experts
- Creating a strong bond between industrial needs and academic research outcomes
- Undertaking collaborative projects which offer opportunities for long-term interaction between academia and industry
- Promoting the career of the faculty members by encouraging their research work
- Adopting best teaching practices, imparting employability skills and empowering to become entrepreneurs in the trade.

Program Educational Objectives (PEOs):

PEO1	Learning new technologies and/or undertaking higher education.
PEO2	Leading a team of engineers in executing projects.
PEO3	An entrepreneur in civil engineering community and/or a leadership role exhibiting systematic approach to resolve societal problems with ethical values.

Program Educational Objectives (PSOs):

PSOs	• PSO1: Get proficiency in management and communication skills to become an entrepreneur. • PSO2: Ability to use earth sciences in execution of civil engineering projects.

Program Outcomes (POs): Engineering Graduates will be able to:

- PO-1. Apply knowledge of computing, mathematics, science and engineering basics related to Civil Engineering.
- PO-2. Identify the problems and analyse the solutions by simulating, conducting experiments and interpreting data.
- PO-3 Design civil engineering structures to meet industrial needs.
- PO-4 Explore and investigate contemporary engineering problems and proposed solutions.
- PO-5 Use latest techniques, skills and modern machinery for engineering practices.
- PO-6 Propose civil engineering solutions to solve societal problems.
- PO-7 Design sustainable systems in congruence with social and environmental issues.
- PO-8 Practice professional ethics with legal awareness and societal responsibilities.
- PO-9 Work as an individual or in a team to achieve targets.
- PO-10 Articulate thoughts and ideas effectively at different levels.
- PO-11 Manage financial and human resources for better execution of project.
- PO-12 Participate in lifelong learning process.

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Course outcomes for First Year First Semester Course	
Course Code: 20211101	
Course Title: Theory of Elasticity	
CO1:	Know the definition of stress and deformation and how to determine the components of the stress and strain tensors.
CO2:	Apply the conditions of compatibility and equations of equilibrium.
CO3:	Understand how to express the mechanical characteristics of materials, constitutive equations and generalized Hook law.
CO4:	Use the equilibrium equations stated by the displacements and compatibility conditions stated by stresses
CO5:	Understand index notation of equations, tensor and matrix notation and define state of plane stress, state of plane strain
CO6:	Be able to analyse real problem and to formulate the conditions of theory of elasticity Applications
CO7:	Determine the boundary restrictions in calculations. Solve the basic problems of the theory of elasticity by using Airy function expressed as bi- harmonic function
Course Code:20211102	
Course Title: Structural Dynamics	
CO1:	Understand the response of structural systems to dynamic loads
CO2:	Realize the behaviour and response of linear and nonlinear SDOF and MDOF structures with various dynamic loading
CO3:	Understand the behaviour and response of MDOF structures with various dynamic loading.
CO4:	Possess the ability to find out suitable solution for continuous system
CO5:	Understand the behaviour of structures subjected to dynamic loads under free vibration
CO6:	Understand the behaviour of structures subjected to dynamic loads Harmonic excitation and earthquake load
Course Code: 20211163A	
Course Title: Matrix Analysis of Structures	
CO1:	Perform the structural analysis of determinate and indeterminate structures using classical compatibility methods, such as method of consistent displacements, force and equilibrium Methods
CO2:	Perform structural analysis using the stiffness method.
CO3:	Solve multiple degree of freedom two- and three-dimensional problems involving trusses, beams, frames and plane stress
CO4:	Understand basic finite element analysis
Course Code: 20211163B	
Course Title: Analytical & Numerical Methods for Structural Engineering	
CO1:	Perform structural analysis using the stiffness method.
CO2:	Implement the principles and techniques of photo elastic measurement
CO3:	Obtain the principles and techniques of strain gage measurement
CO4:	Adopt the principles and techniques of moiré analysis
CO5:	Apply the principles and techniques of holographic interferometer
CO6:	Apply the principles and techniques of brittle coating analysis Understand the fundamentals of the theory of elasticity
Course Code: 20211163C	
Course Title: Design of RC Foundations	
CO1:	Understand the fundamentals of the theory of elasticity
CO2:	Implement the principles and techniques of photo elastic measurement
CO3:	Obtain the principles and techniques of strain gage measurement
CO4:	Adopt the principles and techniques of moiré analysis
CO5:	Apply the principles and techniques of holographic interferometer
CO6:	Apply the principles and techniques of brittle coating analysis Understand the fundamentals of the theory of elastic
Course Code:20211164A	
Course Title: Bridge Engineering	
CO1:	Design theories for super structure and substructure of bridges
CO2:	Design Culvert, R.C.C T Beam Bridge
CO3:	Understand the behaviour of continuous bridges, box girder bridges

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CO4:	Possess the knowledge to design prestressed concrete bridges.
CO5:	Design Railway bridges, Plate girder bridges, different types of bearings, abutments, piers and various types of foundations for Bridges
Course Code: 202111164B	
Course Title: Repair and Rehabilitation of Structures	
CO1:	Recognize the mechanisms of degradation of concrete structures and to design durable concrete structures.
CO2:	Conduct field monitoring and non- destructive evaluation of concrete structures.
CO3:	Design and suggest repair strategies for deteriorated concrete structures including repairing with composites.
CO4:	Understand the methods of strengthening methods for concrete structures
CO5:	Assessment of the serviceability and residual life span of concrete structures by Visual inspection and in situ tests
CO6:	Evaluation of causes and mechanism of damage
CO7:	Evaluation of actual capacity of the concrete structure Maintenance strategies
Course Code:202111164C	
Course Title: Advanced Reinforced Concrete Design	
CO1:	Estimate the deflection of Concrete beams and slabs
CO2:	Estimate crack width and its affects
CO3:	Design flat slabs, bunkers, silos and chimneys
CO4:	Understand the thermal effect on concrete members
Course Code: 202111111	
Course Title: Advanced Concrete Technology Laboratory	
CO1:	Conduct various laboratory tests on Cement, Aggregates
CO2:	Know strain measurement
CO3:	Non- destructive testing
CO4:	Chemical analysis on concrete and Aggregate and Sand
Course Code:202111112	
Course Title: Advanced Structural Engineering Laboratory	
CO1:	conduct various laboratory tests on Cement, Aggregates
CO2:	Know strain measurement
CO3:	Non- destructive testing
CO4:	Chemical analysis on concrete and Aggregate and Sand
Course outcomes for First Year Second Semester Course	
Course Code: 20211201	
Course Title: Finite Element Method	
CO1:	Develop finite element formulations of 1 degree of freedom problems and solve them
CO2:	Understand any Finite Element software to perform stress, thermal and modal analysis
CO3:	Compute the stiffness matrices of different elements and system
CO4:	Interpret displacements, strains and stress resultants
Course Code: 20211202	
Course Title: Theory of Plates & Shells	
CO1:	Have a knowledge about various plate theories due to bending
CO2:	Gain the knowledge of Navier"s solution, Levy"s solution and solve for the rectangular and square plates
CO3:	Analyse circular plates with various boundary conditions
CO4:	Focus on the finite difference method of solving plate problems.
CO5:	Ability to realize the potential energy principle and find the solution of rectangular plates for various loadings
CO6:	Understand the behaviour of folded plates and shells.
Course Code: 20211263A	
Course Title: Stability of Structures	
CO1:	Analyse different types of structural instabilities
CO2:	Execute and work out the inelastic buckling using various methodologies.
CO3:	Examine the behaviour of beam columns and frames with and without side sway using classical and stiffness methods
CO4:	To be well versed in the lateral buckling, torsional buckling, Flexural torsional buckling of various beams and non- circular sections.

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Course Code:20211263B	
Course Title: Advanced Steel Design	
CO1:	To learn the fundamentals of seismology and basic earthquake mechanisms, tectonics types of ground motion, and propagation of ground motion.
CO2:	Understand qualitative and quantitative representations of earthquake magnitude
CO3:	Determine the natural frequency of a single degree of freedom dynamic system for given mass, stiffness and damping properties.
CO4:	Determine the maximum dynamic response of an elastic vibrating structure to a given forcing function
CO5:	Learn the fundamentals of building code based structural design
CO6:	Determine the static design base shear based on the type of structural system, irregularity, location and occupancy.
CO7:	Distribute the static base shear to the structure based on vertical distribution of mass horizontal distribution of mass, and centres of rigidity.
CO8:	Recognize special conditions such as irregular buildings, building separation, P- delta
Course Code: 20211263C	
Course Title: Analysis of Offshore Structures	
CO1:	Perform concept development of offshore structure
CO2:	Find the wave force on vertical cylinder
CO3:	Perform static and dynamic analysis of fixed offshore structure
Course Code: 20211264A	
Course Title: Earthquake Resistant Design of Buildings	
CO1:	To learn the fundamentals of seismology and basic earthquake mechanisms, tectonics types of ground motion, and propagation of ground motion.
CO2:	Understand qualitative and quantitative representations of earthquake magnitude
CO3:	Determine the natural frequency of a single degree of freedom dynamic system for given mass, stiffness and damping properties.
CO4:	Determine the maximum dynamic response of an elastic vibrating structure to a given forcing function
CO5:	Learn the fundamentals of building code based structural design
CO6:	Determine the static design base shear based on the type of structural system, irregularity, location and occupancy.
CO7:	Distribute the static base shear to the structure based on vertical distribution of mass horizontal distribution of mass, and centres of rigidity.
CO8:	Recognize special conditions such as irregular buildings, building separation, P- delta
Course Code: 20211264B	
Course Title: Precast and Prefabricated Structures	
CO1:	Analyse the prefabricated load carrying members
CO2:	Analyse the production technology of prefabrication
CO3:	Design and detailing of precast UNIT for factories
CO4:	Design single storied simple frames
Course Code: 20211264C	
Course Title: Earth Retaining Structures	
CO1:	Quantify the lateral earth pressures associated with different earth systems
CO2:	Evaluate the mechanical properties of geosynthetics used for soil reinforcement
CO3:	Identify the merits and demerits of different earth retaining systems.
CO4:	Select the most technically appropriate type of retaining wall for the application from a thorough knowledge of available systems
CO5:	Design of retaining structures using appropriate design methods, factors of safety, earth pressure diagrams and field verification methods
CO6:	Aware of current guidelines regarding the design of earth retaining structures.
CO7:	Design retaining structures considering both external and internal stability aspects
Course Code: 202111211	
Course Title: Computer Aided Design Laboratory	
CO1:	Develop Computer Programs for Analysis and Design of various Structural Elements
CO2:	Use different Structural Engineering software's to solve various civil Engineering programs
Course Code: 202111212	
Course Title: Structural Design laboratory	
CO1:	Develop Computer Programs for Analysis and Design of various Structural Elements

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CO2:	Use different Structural Engineering software's to solve various civil Engineering programs
Course outcomes for Second Year First Semester Course	
Course Code: 20211361A	
Course Title: Design of Prestressed Concrete structures	
CO1:	Explain the principle, types and systems of prestressing and analyse the deflections.
CO2:	Determine the flexural strength and design the flexural members, end blocks.
CO3:	Analyse the statically indeterminate structures and design the continuous beam.
CO4:	Design the tension and compression members and apply it for design of piles.
CO5:	Analyse the stress, deflections, flexural and shear strength and apply it for the design of bridges.
CO6:	Analyse the Composite construction of Pre- stressed and in- situ concrete.
Course Code: 20211361B	
Course Title: Structural Health Monitoring	
CO1:	Diagnose the distress in the structure by understanding the causes and factors
CO2:	Assess the health of structure using static field methods.
CO3:	Assess the health of structure using dynamic field tests
CO4:	Carryout repairs and rehabilitation measures of the structure

GRMT-20 M.Tech Power Systems

Department Vision:

To be a pioneering department in preparing students to compete globally in their profession and making significant contribution to the society.

Department Mission:

- Establishing centers of excellence with focus on advanced technology
- Bypreparingthestudentsforsuccessfulcareersbasedonastrongnormalethicalfoundation
- Deliveringworldclassteaching,mentoring,intellectualstimulation,industrycollaborationsandstateoftheart research
- Bytrainingandeducatingstudentsasglobalcitizenstobecomeentrepreneursintheirchosenfield

Program Educational Objectives (PEOs):

PEO1	Engage in ongoing learning and professional development through self- study,continuing education in Electrical and Electronics Engineering and also in otheralliedfields
PEO2	Apply their engineering skills, exhibiting critical thinking and problem solving skills in professional engineering practices or tackle social, technical andbusinesschallenges
PEO3	Improve professional competence through lifelong learning including higher education and research

Program Specific Outcomes (PSO's):

PSO1	Apply knowledge of power system configuration, electrical equipment and protection practices to the design and specifications of electrical generation, transmission, distribution and utilization systems
PSO2	To design. Analyze, test and evaluate the performance of the electrical machines and transformers
PSO3	To develop the expertise in the technology associated with efficient conversion and control of electrical power by static means from available forms to the Required form

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PSO4	Graduates will able to work as research fellow and implement their knowledge in all electrical and electronics research organization of defense, renewable energy, mines, chemical and power plants

Program Outcomes (POs): Engineering Graduates will be able to:

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

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Course Outcomes or First Year First Semester Course	
CourseCode:20221101	
Course Title: Generation and Measurement of High Voltages	
CO-1	Understand and numerical computation of electrostatic problems
CO-2	Understand the techniques of generation of high AC, DC and transient voltages
CO-3	Measure high AC, Dc and transient voltages
CO-4	Measure high AC, DC and transient currents
CourseCode:20221102	
Course Title :Dielectrics and Insulation Engineering	
CO-1	Learn Properties of insulating materials
CO-2	Know Electrical break down in gas and vacuum insulation
CO-3	Know Electrical breakdown in liquid and solid insulation
CO-4	Know Insulation design in electrical power apparatus
CourseCode:20221161A	
Course Title Power Systems Reforms	
CO-1	Understand of operation of deregulated electricity market systems
CO-2	Know Typical issues in electricity markets
CO-3	Analyzevarioustypesofelectricitymarketoperationalandcontrolissues
CourseCode:20221161B	
Course Title: High Voltage Direct Current Transmission	
CO-1	Understand the various schemes of HVDC transmission
CO-2	Understand the basic HVDC transmission equipment
CO-3	Understand the control of HVDC systems
CO-4	Understand the interaction between HVAC and HVDC system and the various protection schemes of HVDC engineering
CourseCode:20221161C	
Course Title: Break down Phenomenon in Electrical Insulation(Gases, Liquids, Solids and Vacuum	
CO-1	Understand the fundamental process of conduction in gases
CO-2	Understand ionization and break down phenomena in gases
CO-3	Understand break down phenomena in liquid and solid electrics
CO-4	Understand break down phenomena in vacuum
CourseCode:20221162A	
Course Title: High Voltage Power Apparatus and Diagnostics	
CO-1	Learn power transformer, types of insulation material
CO-2	Measure tan delta and capacitance of transformer oil
CO-3	Know the concept of moisture in transformer oil and paper and partial discharges and Degree of polymerization
CO-4	Knowconceptoffouriertransformerandfrequencyresponseanalysisoftransformer Winding
CourseCode:20221162B	

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Course Title: Collision Phenomena in Plasma Science	
CO-1	Understand the collision phenomena in different materials
CO-2	Know Transition from Streamer to Townsend mechanisms of breakdown
CO-3	Understand Electric glow discharge and plasma glow discharge
CourseCode:20221162C	
Course Title: Advanced Electro Magnetic Fields	
CO-1	Know about analysis of electro static fields and properties of potential gradients
CO-2	Knowaboutthedielectricboundaryconditionsandelectricstresscontrolandoptimizationa nd time varying fields
CourseCode:20221103	
Course Title: Research Methodology	
CO-1	Understand some basic concepts of research and its methodologies
CO-2	Identify appropriate research topics
CO-3	Select and define appropriator search problem and parameters
CO-4	Write are search report, thesis and research proposal(grants)
CourseCode:20221111	
Course Title: Simulation Laboratory–I	
CO-1	Distinguish between different load flow methods
CO-2	Analyze Y-bus &Z- bus algorithm
CO-3	Analyze symmetrical &unsymmetrical faults
CO-4	Understand importance of load flow control ,Economic load dispatch and transients ability
CourseCode:20221112	
Course Title: High Voltage Laboratory	
CO-1	Design the various testing procedures of various insulators
CO-2	Design the procedure for calibration of tongtester
CO-3	Compute the break down strength of dielectric coil
CO-4	Determine the leak age current of various insulators

Course Outcomes for First Year Second Semester Course	
CourseCode:20221201	
Course Title: High Voltage Testing Techniques	
CO-1	UnderstanddifferenttestingproceduresonelectricalInsulatingmaterials,Insulation Systems
CO-2	Learn the different testing techniques adopted on electrical power apparatus

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CourseCode:20221202	
Course Title: Surge Phenomenon and Insulation Co-ordination	
CO-1	Understand line concepts of travelling waves and their behavior in transmission systems
CO-2	Understand lighting phenomena and over voltages in power systems
CO-3	Understand the behavior of the transformer when surge voltages are induced
CO-4	Understandtheinsulationcoordinationbetweendifferentprotectingandprotectivedevicesinthe power system
CourseCode:20221261A	
Course Title :Partial Discharges in High Voltage Equipment	
CO-1	Know Types of partial discharge that occurs in the insulation systems
CO-2	Understand Detection of discharges using different detection circuits.
CO-3	Understand Location of partial discharge in electrical apparatus and systems
CourseCode:20221261B	
Course Title: Gas Insulated Systems and Substations	
CO-1	KnowthePropertiesofSF6
CO-2	Understand design and construction of G.I.S Substations
CO-3	Analyze transient Phenomenon and testing ofG.I.S
CO-4	Analyze diagnostics of GIS
CourseCode:20221261C	
Course Title: Pulse Power Engineering	
CO-1	KnowVariousenergystoragedevices,repetitivegeneratorsandcumulativepulselines
CO-2	Know Pulse forming networks and their applications
CO-3	Know Pulse power generators
Course Code:20221262A	
Course Title: Flex ileac transmission Systems	
CO-1	Know the performance improvement of transmission system with facts
CO-2	Get the knowledge of effect of statics hunt and series compensation. Know the effect of UPFC
CO-3	Know the effect UPFC
CO-4	Determine an appropriate facts device for different types of applications
CourseCode:20221262B	
Course Title: EHVAC Transmission	
CO-1	Calculate the transmission line parameters
CO-2	Calculate the field effects on EHV and U HVAC lines.
CO-3	Determine the corona, RI and audiblenoise in EHV and UHV lines
CO-4	Analyze voltage control and compensation problems in EHV and UHV transmission systems
CO-5	Understand reactive power compensation using SVC and TCR
CourseCode:20221262C	
Course Title: Smart Grid Technologies	
CO-1	Understand smart grids and analyse the smart grid policies and developments in smart grids
CO-2	Develop concepts of smart grid technologies in hybrid electrical vehicles etc
CO-3	Understand smart substations, feeder automation, GIS etc
CO-4	Analyze micro grids and distributed generation systems

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CO-5	Analyse the effect of power quality in smart grid and to understand attest developments in ICT for smart grid
CourseCode:20221211	
Course Title: Simulation Laboratory-II	
CO-1	The student should be able to design and analyze the different high voltage generation circuits and the behavior of lines due to switching operations.
CourseCode:20221212	
Course Title: Power Systems Laboratory	
CO-1	Understand procedure for determination of various parameters used in power system as well as performance of transmission line
Course Code:20221231	
Course Title: Mini Project	
CO-1	Identify a current problem through literature /field/ case studies and define the back ground Objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/process.
CO-3	Implement and evaluate the technology at the laboratory level.
CourseCode:20221191A	
Course Title: English for Research Paper Writing	
CO-1	Understand that how to improve your writing skills and level of readability
CO-2	Learn about what to write in each section
CO-3	Understand the skills needed when writing a title and ensure the good quality of paper at very first time submission
CourseCode:20221191B	
Course Title: Disaster Management	
CO-1	Learn to demonstrate a critical understanding of key concepts in disaster risk reduction And humanitarian response
CO-2	Critically evaluate disaster risk reduction and humanitarian response policy and practice From multiple perspectives
CO-3	Develop an understanding of standards of humanitarian response and practical relevance In specific types of disasters and conflict situations
CO-4	Critically understand the strengths and weaknesses of disaster management approaches, planning and Programming in different countries, particularly their home country or the countries they work in
CourseCode:20221191C	
Course Title: Value Education	
CO-1	Knowledge of self-development
CO-2	Learn the importance of Human values
CO-3	Developing the overall personality
Course Code:20221191D	
Course Title: Constitution Of India	
CO-1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before The arrival of Gandhi in Indian politics
CO-2	Discuss the intellectual origins of the frame work of argument that in formed the Concept validation of social reforms leading to revolution in India
CO-3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal Of direct elections through adult suffrage in the Indian Constitution
CO-4	Discuss the passage of the Hindu CodeBillof1956
Course Code:20221191E	
Course Title: Pedagogy Studies	
CO-1	What pedagogical practices are being used by teachers inform a land informal classrooms In developing countries
CO-2	What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners
CO-3	Howcanteachereducation(curriculumandpracticum)andtheschoolcurriculumand

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	Guidance materials best support effective pedagogy
Course Code:20221191F	
Course Title :Personality Development through Life Enlightenment Skills	
CO-1	Knowledge of self-development
CO2	Learn the importance of Human values
CO-3	Developing the overall personality
Course Outcomes for Second Year First Semester course	
Course Code:20221361A	
Course Title: Energy Audit Conservation & Management	
CO-1	Understand the principle of energy audit and their economic aspects
CO-2	Recommend energy efficient motors and design good lighting system
CO-3	Understand advantages to improve the power factor
CO-4	Evaluate the depreciation of equipment
Course Code:20221361B	
Course Title: Power Quality	
CO-1	Identify the issues related to power quality in power systems
CO-2	Addressthe problemsoftransientandlongdurationvoltagevariationsinpowersystems
CO-3	Analyze the effects of harmonics and study of different mitigation techniques
CO-4	Identify the importance of custom power devices and their applications
CO-5	Acquire knowledge on different compensation techniques to minimize power quality disturbances
Course Code:20221361C	
Course Title: Power System Transients	
CO-1	Understand the severity of over voltages due to faults on a given powers system
CO-2	To limit the effects of lightning over voltages in power systems
CO-3	Understandthevarioustransientovervoltagesandtheireffectsonpowersystem
CourseCode:20221341	
Course Title: Dissertation–I/Industrial Project	
CO-1	Identify a current problem through literature/ field/ case studies and define the back ground objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/process.
CO-3	Implement and evaluate the technology at the laboratory level.
Course Outcomes for Second Year Second Semester Course	
Course Code:20221441	
Course Title: Dissertation Phase-II	
CO-1	Identify a current problem through literature /field/ case studies and define the back ground objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/process.
CO-3	Implement and evaluate the technology at the laboratory level.
CO-4	Write report and present it effectively.

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GRMT-20 M.Tech Mechanical Engineering

Department Vision: To be recognized as a Global Centre of Excellence in Mechanical Engineering Education, Research and Consultancy

Department Mission: Department of Mechanical Engineering strives to provide scope for all round development of the students and staff by engaging them in various activities such as

- Participative learning so that students internalize their classroom learning practices.
- Student centric learning practices such as summary sessions, learn-ahead-of class, problem solving.
- Extensive practical courses to foster learning by observation.
- Exposing students, faculty and staff to various industrial practices and usage of modern tools to reinforce their classroom/laboratory learning.
- Sensitization towards importance of ethical practice, societal responsibility, leadership skills, entrepreneurship skills, communication skills and lifelong learning.

Program Educational Objectives(PEOs):

PEO1	Working professional in Mechanical Engineering field or other disciplines to develop products, processes to solve Mechanical Engineering related or other problems for betterment of society.
PEO2	Pursuing further education to enrich their knowledge in Mechanical Engineering or other fields.
PEO3	Undertaking entrepreneurial ventures in Mechanical Engineering or other disciplines.

Program Specific Outcomes(PSO's):

PSO1	Join a technically sophisticated workforce as successful professionals in a wide range of mechanical engineering and related fields.
PSO2	Continuously improve and expand their technical and professional skills through formal means as well as through informal self-study.
PSO3	Pursue advanced degrees in engineering, business, or other professional fields.
PSO4	Advance themselves professionally and personally by accepting professional and social responsibilities and pursuing leadership roles.

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Program Outcomes (POs) :Engineering Graduates will be able to:

1	Apply fundamental knowledge of Science, Mathematics and Engineering principles in solving problems related to Mechanical Engineering.
2	Apply principles of design engineering, thermal engineering, production engineering and industrial engineering to arrive at a physically meaningful analysis of engineering problems.
3	Present feasible designs for simple domestic and industrial Mechanical Engineering problems through drawings and other multimedia tools to meet desired needs.
4	Identify, formulate and solve Mechanical engineering problems through rigorous research methodology.
5	Use Drafting, Modeling and Analysis Software and/or hardware tools for meaningful and economically viable Engineering practice.
6	Apply knowledge of Thermal, Design, Automation Technologies and Management principles to inter-disciplinary engineering problems and their societal implications.
7	Understand and propose, where ever possible, environment-friendly and sustainable solutions to Mechanical Engineering problems.
8	Expertise in following ethical code of conduct in professional activities.
9	Use their analytical, teamwork, leadership skills in the development of products and provide solutions to problems sought by local and/or global community.
10	Communicate verbally, textually and graphically to collaborate effectively towards engineering activities
11	Inspire confidence in team members to realize the goals of the organization and manage finances an sizeable projects by choosing the right blend of common sense solutions.
12	Develop confidence and a sense of curiosity towards life-long learning to adapt to ever changing technologies.

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Course outcomes for First Year First Semester Course	
Course Code:20231101	
Course Title: Geometric Modeling.	
CO1:	Describe the concepts and functions involved in Cubic Spline curves.
CO2:	Discuss the properties and characteristics of Bezier curves.
CO3:	Analyze the derivatives for B-Spline Curves.
CO4:	Categorize various surfaces used in Geometric modeling.
CO5:	Explain different types of solids and their modeling concepts.
Course Code:20231102	
Course Title: Computer Aided Manufacturing	
CO1:	Illustrate various part programming techniques.
CO2:	Discuss the tooling systems for CNC machines.
CO3:	Describe the concept of post processors for CNC.
CO4:	Explain the functions and applications of micro controllers and PLC's.
CO5:	Explain the various concepts of CAPP systems.
Course Code: 20231164A	
Course Title: Computational Methods in Engineering	
CO1:	Use various Numerical Methods to solve Engineering problems.
CO2:	Solve boundary and Characteristic Problems through set of equations.
CO3:	Explain transformation techniques like Laplace, Discrete and Fast Fourier transforms.
CO4:	Identify various methods to derive Numerical solutions of Partial Differential Equations.
CO5:	Describe the procedure to solve characteristic wave equations.
Course Code: 20231164B	
Course Title: Composite Materials	
CO1:	Use different types of manufacturing processes in the preparation of composite materials.
CO2:	Explain about the polymer and metal matrix composites.
CO3:	Discuss about the ceramic matrix composites and carbon fiber/carbon matrix composites.
CO4:	Assess the performance of composites.
C05:	Explain the micro and macro mechanical behavior of composites.
Course code:20231164C	
Course Title: Industrial Robotics	
CO1:	Discuss components of different robots and their coordinate systems used in industries.
CO2:	Use the concepts of robot kinematics to analyze the arm movement.
C03:	Discuss the types of sensors and end effectors for various robot configurations.
C04	Identify suitable programming languages and commands for different robot applications.
CO5:	Explain the robot cell design and their applications.
Course Code: 20231165A	
Course Title: Mechatronics	
CO1:	Discuss the key elements of mechatronic system.
CO2:	Describe the various types of solid state devices like PN junction diode, BJT, FET and signal conditioning.
CO3:	Outline various sensors and actuators for an engineering application.
CO4:	Construct PLC program and implementation of real life systems.
CO5:	Use appropriate microprocessor and microcontroller for interfacing sensors, actuators and other mechatronic elements.
Course Code:20231165B	
Course Title: Mechanical Vibrations	
CO1:	Explain the damped and un-damped vibration systems with single degree of freedom.
CO2:	Analyze the response of machine components in forced vibration with periodic excitations.
CO3:	Describe the damped and un-damped vibration systems with multi degree of freedom.
CO4:	Solve the vibrational problems using numerical approach.
CO5:	Analyze the torsional vibrations of multi degree of freedom and its measurement.
Course Code:20231165C	
Course Title: Product Design and Development	
CO1:	Describe the product development process and creativity techniques of design.
CO2:	Explain the various concepts of conceptual, industrial design and DOE techniques to select values of design variables.
CO3;	Recommend designs to reduce environmental impacts, manufacturing and assembly costs.
CO4:	Discuss the elements of economic analysis, assessment of ergonomic and aesthetic needs for

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	industrial design.
CO5:	Explain the elements of concurrent engineering and role of intellectual property in product development.
Course Code:20231103	
Course Title: Research Methodology	
CO1:	Describe the product development process and creativity techniques of design.
CO2:	Explain the various concepts of conceptual, industrial design and DOE techniques to select values of design variables.
CO3:	Recommend designs to reduce environmental impacts, manufacturing and assembly costs.
CO4:	Discuss the elements of economic analysis, assessment of ergonomic and aesthetic needs for industrial design.
CO5:	Explain the elements of concurrent engineering and role of intellectual property in product development.
Course Code:20201111	
Course Title: Advanced CAD Lab	
CO1:	Solve problems related to truss structure.
CO2:	Examine stress distribution on axi-symmetric geometries.
CO3:	Solve beam problems for different support conditions.
CO4:	Analyze uniaxial and biaxial plane stress and strain on rectangular plate.
CO5:	Identify stress distribution on corner bracket.
Course Code:20231112	
Course Title: Manufacturing Lab	
CO1:	Understand construction of cooling curves of metals and alloys.
CO2:	Gain knowledge on forging and forming methods.
CO3:	Gain the knowledge on joining of metals using welding process.
CO4:	Understand the process of producing components using powder metallurgy and additive manufacturing.
CO5:	Estimation of chip thickness, shear angle and cutting forces in machining.
Course Code:20231196	
Course Title: English for Research Paper Writing	
CO1:	Understand how to improve writing skills and level of readability and Learn about what to write in each section of research paper
CO2:	Understand the skills needed when writing a Title. Ensure the good quality of paper at very first-time submission
CO3:	Plan and organize the text and produce the data with proper relevancy
CO4:	Improve Academic writing skills, that benefit further performance
CO5:	Learn different types of writing
Course Code:20231196a	
Course Title: Disaster Management	
CO1:	Distinguish between Hazard and Disaster
CO2:	To identify the loss of Human and Animal Life
CO3:	To discuss about the Floods, Droughts, Cyclonic and Coastal Hazards
CO4:	Evaluate the risk factor in disaster
CO5:	Analyze the disaster risk reduction
Course Code:20231196b	
Course Title: Value Education	
CO1:	Gain Knowledge of self-development
CO2:	Learn the importance of Human values.
CO3:	Develop the overall personality

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Course outcomes for First Year Second Semester Course	
Course Code:20231201	
Course Title: Optimization & Reliability	
CO1:	Solve single and multi-variable optimization problems.
CO2:	Solve the engineering problems using steepest descent, Newton's, Pattern search and penalty methods.
CO3:	Explain the genetic algorithm and programming for engineering problems.
CO4:	Discuss the various applications of optimization in design and manufacturing systems.
C05:	Explain the concept of reliability and its applications.
Course Code:20231202	
Course Title: Advanced Manufacturing Processes	
CO1:	Identify the suitable surface treatment technique for given application.
CO2:	Explain manufacturing techniques of composites.
CO3:	Discuss the working principle and fabrication methods of microelectronic devices.
CO4:	Describe working principle and applications of IBM, LBM, EBM and PAM.
C05:	Discuss various rapid prototyping methods.
Course Code:20231263A	
Course Title: Additive Manufacturing	
CO1:	Identify part orientation and suitable slicing algorithms for minimum build time, support material and part errors.
CO2:	Discuss working principle of rapid prototyping machines.
CO3:	Explain the strategic, operational aspects for the use of prototypes and their applications.
CO4:	Discuss indirect rapid tooling for producing plastic and metallic components.
C05:	Discuss direct tooling techniques for producing plastic and metallic components.
Course Code:20231263B	
Course Title: Hydraulic and Pneumatic Systems	
CO1:	Explain the Fluid power and operation of different types of pumps.
CO2:	Summarize the features and functions of Hydraulic motors, actuators and Flow control valves
CO3:	Explain the different types of Hydraulic circuits and systems
CO4:	Explain the working of different pneumatic circuits and systems
C05:	Summarize the various trouble shooting methods and applications of hydraulic and pneumatic systems.
Course Code:20231263C	
Course Title: Modeling and Simulation of Manufacturing Systems	
CO1:	Explain analytical models and simulation in manufacturing systems.
CO2:	Illustrate techniques for verification and validation of simulation models.
CO3:	Discuss concepts of random number generation and simulation languages.
CO4:	Assess simulation data output analysis using different methods.
C05:	Use simulation to solve queuing, inventory and scheduling problems.
Course Code:20231264A	
Course Title: Materials Characterization Techniques	
CO1:	Identify different materials characterization techniques.
CO2:	Discuss the working principle of optical, scanning electron and transmission electron microscopy and their applications.
CO3:	Explain the thermal characterization techniques.
CO4:	Describe magnetic characterization techniques.
C05:	Discuss the optical and electronic characterization techniques.
Course Code:20231264B	
Course Title: Automation in Manufacturing	
CO1:	Explain the different fundamental concepts of automation & its tools.
CO2:	Classify the automated material handling ,automatedstorage& retrieval systems in industries.
CO3:	Analyze the automated production lines & line balancing methods.
CO4:	Discuss the fundamentals of automated assembly systems.
C05:	Assess the concepts of quality control & support systems.
Course Code:20231264C	
Course Title: Finite Element Method	
CO1:	Use the concepts of variational and weighted residual methods in FEA.

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CO2:	Identify the applications and characteristics of Finite Elements in one-dimensional structural and thermal problems.
CO3:	Develop element characteristic equation and generate global stiffness matrices for structural and thermal analyses.
CO4:	Identify the parametric elements and their refinement to solve problems.
C05:	Solve the structural problems under static and dynamic conditions.
Course Code:20231211	
Course Title: Simulation of Manufacturing Lab	
CO1:	Simulate solidification behavior in metal casting process.
CO2:	Investigate deformation behavior in bulk forming processes.
CO3:	Apply simulation techniques to analyze deformation behavior in sheet metal forming processes.
CO4:	Simulate welding processes.
C05:	Generate tool path for turning and milling operations.
Course Code:20231212	
Course Title: Material Characterization Lab	
CO1:	Assess the grain size of the different structures.
CO2:	Determine the hardness of materials by using different methods.
CO3:	Determine the tensile properties of steels.
CO4:	Examine the compressive strength of different materials.
C05:	Assess the wear properties of ferrous and non-ferrous materials.
Course Code:20231221	
Course Title: Mini Project With Seminar	
CO1:	
Course Code: 20231295	
Course Title: Constitution of India	
CO1:	Discuss the growth of the demand for civil rights in India for the bulk of Indians
CO2:	before the arrival of Gandhi in Indian politics.
CO3:	Discuss the intellectual origins of the frame work of argument that informed the conceptualization of social reforms leading to revolution in India.
CO4:	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
C05:	Discuss the passage of the Hindu Code Bill of1956
Course Code:20231295a	
Course Title: Pedagogy Studies	
CO1:	identify what pedagogical practices are being used by teachers in formal and informalclassrooms in developing countries.
CO2:	Understand what is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
CO3:	Know how can teacher education (curriculum and practicum) and the school Curriculum and guidance materials best support effective pedagog
Course Code: 20231295b	
Course Title: Personality Development Through Life Enlightenment Skills	
CO1:	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
CO2:	Stand as a person who has studied Geeta will lead the nation and mankind to peace and prosperit
CO3:	Study Neetishatakamthat will help in developing versatile personality ofstudents.
Course outcomes for Second Year First Semester Course	
Course Code:20231361A	
Course Title: Quality Engineering in Manufacturing	
CO1:	Discuss the concepts of quality.
CO2:	Use the various methods of tolerance design and tolerancing.
CO3:	Solve the various quality related problems using ANOVA.
CO4:	Explain the orthogonal arrays and conduction of experiments.
C05:	Explain the six sigma and its implementation.
Course Code:20231361B	
Course Title: Green Manufacturing	
CO1:	Explain the basic design concepts and the operation of sustainable green manufacturing.
CO2:	List the principles, methods, techniques in green manufacturing.

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CO3:	Illustrate the life cycle of production systems.
CO4:	Explain the environmental implications of nano-manufacturing.
C05:	Discuss the packaging and the supply chain of green manufacturing.
Course Code:20231361C	
Course Title: MOOCS-1 (NPTEL/ SWAYAM) 12 Week program related to the programme which is not listed in the course structure	
CO1:	
Course Code:20231361e	
Course Title: MOOCS-2(NPTEL/ SWAYAM) Any12 Week Course on Engineering/Management/ Mathematics offered by other than parent department	
CO1:	
Course Code:20231362a	
Course Title: Composite Materials, Cost Management of Engineering Projects	
CO1:	identify, describe and evaluate the properties of fibre reinforcements, polymer matrix materials and commercial composites.
CO2:	Develop competency in one or more common composite manufacturing techniques, and be able to select the appropriate technique for manufacture of fibre-reinforced composite products.
CO3:	Apply knowledge of composite mechanical performance and manufacturing methods to a composites design project.
CO4:	Understand project characteristics and various stages of a project. Market, Technical, Financial and Economic.
C05:	Analyze the learning and understand techniques for Project planning, scheduling and Execution Control
Course Code:20231362b	
Course Title: Energy Management	
Course Title: Internet of Things and Applications	
CO1:	Learn the Architecture of iot,Sensors,Actuators,ARM processors.
CO2:	Learn the various Communication protocols present in a network.
CO3:	Apply the practical knowledge to Arduino board.
CO4:	Analyze the Machine learning and various network services.
C05:	Learn the importance of Big data and Virtualization concepts.
Course Code:20231362d	
Course Title: Cyber Security	
CO1:	Analyze and evaluate the cyber security needs of an organization.
CO2:	Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.
CO3:	Measure the performance and troubleshoot cyber security systems.
CO4:	implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.
Course Code:20231341	
Course Title: Dissertation-I/ Industrial Project	
CO1:	Research relevant and reliable literature to evaluate the state of the field.
CO2:	Undertake problem identification, formulation and solution.
CO3:	To allow students to develop problem solving, analysis, synthesis and evaluation skills.
CO4:	Deliver presentations that are required as engineers.
Course outcomes for Second Year Second Semester Course	
Course Code:20231441	
Course Title: Dissertation -II	
CO1:	Formulate research problems and provide solutions through the rigorous literature review and application of domain knowledge
CO2:	Design solutions to complex engineering problems keeping in mind the safety, societal, ethical, economic and environmental considerations
CO3:	Apply research based knowledge, and appropriate tools to investigate and arrive at substantial conclusions
CO4:	Make effective presentations and write clear reports to interact with the scientific community

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GRMT-20 M.Tech VLSI

Department Vision:

Create an educational environment to mound the students to meet the challenges of modern Electronics & Communication industry through state of the art Technical knowledge and Innovative experimental Approaches.

Department Mission:

1. To create learning, development and test in environment to meet ever challenging needs of the Electronic industry
2. TocreateentrepreneurialenvironmentandindustryInteractionforMutualbenefit
3. Tobecomeaglobalpartnerintraininghumanresourcesinthefieldsofchipdesign, instrumentation and networking
4. To associate with internationally reputed Institutions for Academic excellence and collaborative Research

Program Educational Objectives (PEOs) :

PEO1	To prepare students with excellent comprehension of basic Sciences, mathematics and engineering subjects facilitating them to gain employment or pursue postgraduate studies with an appreciation for lifelong learning.
PEO2	To train students with problem solving capabilities such as analysis and design with adequate practical skills wherein they demonstrate creativity and innovation that would enable them to develop state of the art equipment and technologies of multidisciplinary nature for societal development.

Program Specific Outcomes (PSO's):

PSO1	Analyze and design analog and digital circuits or systems for a given specification and function.
PSO2	lement functional blocks of hardware-software co-designs for signal processing and communication applications.

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Program Outcomes (POs): Engineering Graduates will be able to:

1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis:** Identify, formulate, review research literature, and analyze complexengineeringproblemsreachingsubstantiatedconclusionsusingfirstprinciplesofmathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problemsanddesignsystemcomponentsorprocessesthatmeetthespecifiedneedswithappropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems:** Use research- based knowledge and research methodsincludingdesignofexperiments,analysisandinterpretationofdata,andsynthesis of information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understand in go the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety ,legal and culture issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work :** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehendandwriteeffectivereportsanddesigndocumentation,makeeffectivepresentations, And give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a Member and leader in a team, to manage projects and in multi-disciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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Course Outcomes for First Year First Semester Course	
Course Code: 20242101	
Course Title: RTL SIMULATION AND SYNTHESIS WITH PLDs	
CO-1	Develop the Verilog HDL code to design a digital circuit.
CO-2	Appreciate the analysis of finite state machine of a controlling circuit.
CO-3	Develop finite state machines and RTL design using reconfigurable logic.
CO-4	Understand the static timing analysis and clock issues in digital circuits.
CO-5	Verify the functionality of the digital designs using PLDs
Course Code: 20242102	
Course Title: MICROCONTROLLERS AND PROGRAMMABLE DIGITAL SIGNAL PROCESSORS	
CO-1	Compare and select ARM processor core based SOC with several features/peripherals based on requirements of embedded applications.
CO-2	Apply RAM and ROM memory interfacing concepts and address calculations.
CO-3	Identify and characterize architecture of Programmable DSP Processors.
CO-4	Analyze the concepts of Input / Output device interfacing with processors.
CO-5	Develop small applications by utilizing the ARM processor core and DSP processor-based platform.
Course code: 20242164A	
Course Title: VLSI TECHNOLOGY AND DESIGN	
CO-1	Review FET fundamentals for VLSI design.
CO-2	Acquire knowledge about stick diagrams and layouts.
CO-3	Understand the physical design process of VLSI design flow.
CO-4	Design the subsystems based on VLSI concepts.
CO-5	Learn the design methodologies of chip design.
Course Code: 20242164B	
Course Title: VLSI SIGNAL PROCESSING	
CO-1	Understand VLSI design methodology for signal processing systems
CO-2	Be familiar with VLSI algorithms and architectures for DSP.
CO-3	Be able to implement basic architectures for DSP using CAD tools.
CO-4	Be able to get the knowledge about the various VLSI structures for signal processing.
Course code: 20242164C	
Course Title: CAD OF DIGITAL SYSTEM	
CO-1	Fundamentals of CAD tools for modelling, design, test and verification of VLSI systems.
CO-2	Understand various phases of CAD, including simulation, physical design, test and verification.
CO-3	Demonstrate knowledge of computational algorithms and tools for CAD.
CO-4	Understand Hardware Models for High level Synthesis.
CO-5	Perform Verilog implementation of simple circuits.
Course code: 20242103	
Course Title: RESEARCH METHODOLOGY	
CO-1	Understand research problem formulation
CO-2	Analyze research related information
CO-3	Follow research ethics
CO-4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity
CO-5	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D
Course code: 20242111	
Course Title: RTL SIMULATION AND SYNTHESIS WITH PLDs Lab	
CO-1	Develop the Verilog HDL to design a digital circuit
CO-2	Identify, formulate, solve and implement problems in signal processing, communication Systems etc using RTL design tools.

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CO-3	Use EDA tools like Cadence, Mentor Graphics and Xilinx.
CO-4	Verify the functionality of the digital designs using PLDs.
FIRST YEAR SECOND SEMESTER	
Course code: 20242201	
Course Title: Analog and Digital CMOS VLSI Design	
CO-1	Identify the trade-offs involved in analog integrated circuit design.
CO-2	Analyse complex engineering problems critically in the domain of analog IC design for conducting research.
CO-3	Demonstrate advanced knowledge in Static and dynamic characteristics of CMOS, Alternative CMOS Logics, Estimation of Delay and Power, Adders Design.
CO-4	Solve engineering problems for feasible and optimal solutions in the core area of digital ICs.
CO-5	Understand and appreciate the importance of noise and distortion in analog circuits.
Coursecode:20242202	
Course Title: REAL TIME OPERATING SYSTEMS	
CO-1	Illustrate real time programming concepts.
CO-2	Apply RTOS functions to implement embedded applications.
CO-3	Understand Interrupt service mechanism and I/O subsystem design.
CO-4	Describe various types of Memory Management of RTOS.
CO-5	Understand fundamentals of design consideration for embedded applications.
Course code: 20242263A	
Course Title: SYSTEM DESIGN WITH EMBEDDED LINUX	
CO-1	Understand embedded Linux development model.
CO-2	Write and debug applications and drivers in embedded Linux.
CO-3	Discuss embedded storage and drivers for real time applications.
CO-4	Learn real-time Linux and programming.
CO-5	Understand and create Linux BSP for a hardware platform.
Coursecode:20242264A	
Course Title: PHYSICAL DESIGN AUTOMATION	
CO-1	Understand the relationship between design automation algorithms.
CO-2	Learn various constraints posed by VLSI fabrication and design technology.
CO-3	Adapt the design algorithms to meet the critical design parameters.
CO-4	Identify layout optimization techniques and map them to the algorithms.
CO-5	Develop proto-type EDA tool and test its efficacy.
Coursecode:20242264A	
Course Title: ANALOG AND DIGITAL CMOS VLSI DESIGN LAB	
CO-1	Design basic concepts of VLSI devices and Amplifiers
CO-2	Design the Cascade and simple current mirrors
CO-3	Design the Logic gates using the software tools and verifying them
CO-4	Design Flip-Flops, Latches and counters
SECOND YEAR FIRST SEMESTER	
Coursecode:20242361A	
Course Title: INTERNET OF THINGS AND APPLICATIONS	
CO-1	Apply the Knowledge in IOT Technologies and Data management.
CO-2	Determine the values chains Perspective of M2M to IOT.
CO-3	Implement the state of the Architecture of an IOT.
CO-4	Compare IOT Applications in Industrial & real world.
CO-5	Demonstrate knowledge and understanding the security and ethical issues of an IOT.
Coursecode:2042361B	
Course Title: DESIGN FOR TESTABILITY	
CO-1	Analyze the need for fault modeling and testing of digital circuits
CO-2	Generate fault lists for digital circuits and compress the tests for efficiency
CO-3	Create tests for digital memories and analyze failures in them
CO-4	Apply boundary scan technique to validate the performance of digital circuits
CO-5	Design built-in self tests for complex digital circuits
Coursecode:2042361C	
Course Title: ARTIFICIAL INTELLIGENCE	

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CO-1	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
CO-2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation and learning.
CO-3	Understand mathematical models and apply them to a range of AI problems.
CO-4	Experiment with a machine learning model for simulation and analysis.
CO-5	Investigate applications of AI techniques in artificial neural networks and other machine learning models.

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Technology (Autonomous)
NH-16, Chaitanya Knowledge City,
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1.1.1: Curricula developed and implemented have relevance to the local, regional, national, and global developmental needs, which is reflected in the Programme outcomes (POs) and Course Outcomes(COs) of the Programmes offered by the institution



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PEOs, PSOs & COs

GRMT 17 M.Tech (Civil Engineering)

Course outcomes (CO's) of all courses of all programs offered by the institution

Department Vision: To be the best Civil Engineering department in the region by means of good teaching, research and consultancy that serves the society.

Department Mission:

- Arranging field visits, guest lectures and interactive sessions with subject experts
- Creating a strong bond between industrial needs and academic research outcomes
- Undertaking collaborative projects which offer opportunities for long-term interaction between academia and industry
- Promoting the career of the faculty members by encouraging their research work
- Adopting best teaching practices, imparting employability skills and empowering to become entrepreneurs in the trade.

Program Educational Objectives (PEOs):

PEO1	Learning new technologies and/or undertaking higher education.
PEO2	Leading a team of engineers in executing projects.
PEO3	An entrepreneur in civil engineering community and/or a leadership role exhibiting systematic approach to resolve societal problems with ethical values.

Program Educational Objectives (PSOs):

PSO1:	Get proficiency in management and communication skills to become an entrepreneur.
PSO2:	Ability to use earth sciences in execution of civil engineering projects.

Program Outcomes (POs): Engineering Graduates will be able to:

- PO-1. Apply knowledge of computing, mathematics, science and engineering basics related to Civil Engineering.
- PO-2. Identify the problems and analyse the solutions by simulating, conducting experiments and interpreting Data.
- PO-3 Design civil engineering structures to meet industrial needs.
- PO-4 Explore and investigate contemporary engineering problems and proposed solutions.
- PO-5 Use latest techniques, skills and modern machinery for engineering practices.
- PO-6 Propose civil engineering solutions to solve societal problems.
- PO-7 Design sustainable systems in congruence with social and environmental issues.
- PO-8 Practice professional ethics with legal awareness and societal responsibilities.
- PO-9 Work as an individual or in a team to achieve targets.
- PO-10 Articulate thoughts and ideas effectively at different levels.
- PO-11 Manage financial and human resources for better execution of project.
- PO-12 Participate in lifelong learning process.

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Course outcomes for First Year First Semester Course	
Course Code: 17211102	
Course Title: Theory of Elasticity	
CO1:	Know the definition of stress and deformation and how to determine the components of the stress and strain tensors.
CO2:	Apply the conditions of compatibility and equations of equilibrium.
CO3:	Understand how to express the mechanical characteristics of materials, constitutive equations and generalized Hook law.
CO4:	Use the equilibrium equations stated by the displacements and compatibility conditions stated by stresses
CO5:	Understand index notation of equations, tensor and matrix notation and define state of plane stress, state of plane strain
CO6:	Be able to analyse real problem and to formulate the conditions of theory of elasticity Applications
CO7:	Determine the boundary restrictions in calculations. Solve the basic problems of the theory of elasticity by using Airy function expressed as bi- harmonic function
Course Code: 17211103	
Course Title: Matrix Analysis of Structures	
CO1:	Perform the structural analysis of determinate and indeterminate structures using classical compatibility methods, such as method of consistent displacements, force and equilibrium Methods
CO2:	Perform structural analysis using the stiffness method.
CO3:	Solve multiple degree of freedom two- and three-dimensional problems involving trusses, beams, frames and plane stress
CO4:	Understand basic finite element analysis
Course Code:17211104	
Course Title: Structural Dynamics	
CO1:	Understand the response of structural systems to dynamic loads
CO2:	Realize the behaviour and response of linear and nonlinear SDOF and MDOF structures with various dynamic loading
CO3:	Understand the behaviour and response of MDOF structures with various dynamic Loading.
CO4:	Possess the ability to find out suitable solution for continuous system
CO5:	Understand the behaviour of structures subjected to dynamic loads under free vibration
CO6:	Understand the behaviour of structures subjected to dynamic loads Harmonic excitation and earthquake load
Course Code:17211161a	
Course Title: Experimental Stress Analysis	
CO1:	Explain the measurement of strain under static and dynamic loads.
CO2:	Describe the Mechanical, optical, pneumatic and electrical Strain gauges for strain measurement
CO3:	Create awareness about the fixing of gauges and temperature Effects in bonded gauges and measure of stress in stress Gauges.
CO4:	Analysis of measuring circuits and strains of different strain Gauge rosettes.
CO5:	Describe the measurements by using transducers and exciters

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Course Code: 17211162a	
Course Title: Repair and Rehabilitation of Structures	
CO1:	Recognize the mechanisms of degradation of concrete structures and to design durable concrete structures.
CO2:	Conduct field monitoring and non- destructive evaluation of concrete structures.
CO3:	Design and suggest repair strategies for deteriorated concrete structures including repairing with composites.
CO4:	Understand the methods of strengthening methods for concrete structures
CO5:	Assessment of the serviceability and residual life span of concrete structures by Visual inspection and in situ tests
CO6:	Evaluation of causes and mechanism of damage
CO7:	Evaluation of actual capacity of the concrete structure Maintenance strategies
Course Code: 17211111	
Course Title: Advanced Structural Engineering Laboratory	
CO1:	conduct various laboratory tests on Cement, Aggregates
CO2:	Know strain measurement
CO3:	Non- destructive testing
CO4:	Chemical analysis on concrete and Aggregate and Sand
Course outcomes for First Year Second Semester Course	
Course Code:17211201	
Course Title: Finite Element Method	
CO1:	Develop finite element formulations of 1 degree of freedom problems and solve them
CO2:	Understand any Finite Element software to perform stress, thermal and modal analysis
CO3:	Compute the stiffness matrices of different elements and system
CO4:	Interpret displacements, strains and stress resultants
Course Code: 17211202	
Course Title: Earthquake Resistant Design	
CO1:	To learn the fundamentals of seismology and basic earthquake mechanisms, tectonics types ofground motion, and propagation of ground motion.
CO2:	Understand qualitative and quantitative representations of earthquake magnitude
CO3:	Determine the natural frequency of a single degree of freedom dynamic system for given mass, stiffness and damping properties.
CO4:	Determine the maximum dynamic response of an elastic vibrating structure to a given forcing function
CO5:	Learn the fundamentals of building code based structural design
CO6:	Determine the static design base shear based on the type of structural system, irregularity, location and occupancy.

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CO7:	Distribute the static base shear to the structure based on vertical distribution of mass horizontal distribution of mass, and centres of rigidity.
CO8:	Recognize special conditions such as irregular buildings, building separation, P- delta
Course Code:17211203	
Course Title: Stability of Structures	
CO1:	Analyse different types of structural instabilities
CO2:	Execute and work out the inelastic buckling using various methodologies.
CO3:	Examine the behaviour of beam columns and frames with and without side sway using classical and stiffness methods
CO4:	To be well versed in the lateral buckling, tensional buckling, Flexural tensional buckling of various beams and non- circular sections.
Course Code:17211204	
Course Title: Theory of Plates & Shells	
CO1:	Have a knowledge about various plate theories due to bending
CO2:	Gain the knowledge of Navier"s solution, Levy"s solution and solve for the rectangular and square plates
CO3:	Analyse circular plates with various boundary conditions
CO4:	Focus on the finite difference method of solving plate problems.
CO5:	Ability to realize the potential energy principle and find the solution of rectangular plates for various loadings
CO6:	Understand the behaviour of folded plates and shells.
Course Code: 17211263a	
Course Title: Advanced Pre-Stressed Concrete	
CO1:	Understand the basic concepts about pressurised concrete
CO2:	Analyse pre-stressed concrete structures
CO3:	Calculate deflections of pre-stressed members
CO4:	Gain the knowledge about composite structural members
Course Code: 17211264c	
Course Title: Earth Retaining Structures	
CO1:	Quantify the lateral earth pressures associated with different earth systems
CO2:	Evaluate the mechanical properties of geosynthetics used for soil reinforcement
CO3:	Identify the merits and demerits of different earth retaining systems.
CO4:	Select the most technically appropriate type of retaining wall for the application from a thorough knowledge of available systems
CO5:	Design of retaining structures using appropriate design methods, factors of safety, earth pressure diagrams and field verification methods
CO6:	Aware of current guidelines regarding the design of earth retaining structures.
CO7:	Design retaining structures considering both external and internal stability aspects

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Course Code: 17211211	
Course Title: CAD Laboratory	
CO1:	Develop Computer Programs for Analysis and Design of various Structural Elements
CO2:	Use different Structural Engineering software's to solve various civil Engineering programs

M.TECH POWER SYSTEMS (Electrical & Electronics Engineering)

Department Vision

To be a pioneering department in preparing students to compete globally in their profession and making significant contribution to the society.

Department Mission

- Establishing centres of excellence with focus on advanced technology
- By preparing the students for successful careers based on a strong normal ethicalfoundation
- Delivering world class teaching, mentoring, intellectual stimulation, industry collaborations and state of the art research
- By training and educating students as global citizens to become entrepreneurs in their chosen field

Program Educational Objectives (PEOs):

PEO1	Engage in ongoing learning and professional development through self- study, continuing education in Electrical and Electronics Engineering and also in other allied fields
PEO2	Apply their engineering skills, exhibiting critical thinking and problem solving skills in professional engineering practices or tackle social, technical and business challenges
PEO3	Improve professional competence through lifelong learning including higher education and research

Program Specific Outcomes (PSO's):

PSO1	Apply knowledge of power system configuration, electrical equipment and protection practices to the design and specifications of electrical generation, transmission, distribution and utilization systems
PSO2	To design. Analyze, test and evaluate the performance of the electrical machines and transformers
PSO3	To develop the expertise in the technology associated with efficient conversion andcontrol of electrical power by static means from available forms to the required form
PSO4	Graduates will able to work as research fellow and implement their knowledge in all electrical and electronics research organization of defense, renewable energy, mines, chemical and power plants

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Program Outcomes (POs): Engineering Graduates will be able to:

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

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Course outcomes (Cos) of all courses of all programs offered by EEE Department

Course Outcomes for First Year First Semester Course	
Course Code: 17221101	
Course Title: Generation and Measurement of High Voltages	
CO-1	Understand numerical computation of electrostatic problems
CO-2	Understand the techniques of generation of high AC, DC and transient voltages
CO-3	Measure high AC, DC and transient voltages
CO-4	Measure high AC, DC and transient currents
Course Code: 17221102	
Course Title: Dielectrics and Insulation Engineering	
CO-1	Learn Properties of insulating materials
CO-2	Know Electrical breakdown in gas and vacuum insulation
CO-3	Know Electrical breakdown in liquid and solid insulation
CO-4	Know Insulation design in electrical power apparatus
Course Code: 17221103	
Course Title: High Voltage Direct Current Transmission	
CO-1	Understand the basic HVDC transmission equipment
CO-2	Understand the control of HVDC systems
CO-3	Understand the interaction between HVAC and HVDC system and the variousprotection schemes of HVDC engineering
CO-4	Understand the various protection schemes of HVDC engineering.
Course Code: 17221161a	
Course Title: Break down Phenomenon in Electrical Insulation (Gases, Liquids, Solids and Vacuum	
CO-1	Understand the fundamental process of conduction in gases
CO-2	Understand ionization and breakdown phenomena in gases
CO-3	Understand breakdown phenomena in liquid and solid dielectrics
CO-4	Understand breakdown phenomena in vacuum
Course Code: 17221161b	
Course Title: Smart Grid	
CO-1	Understand smart grids and analyze the smart grid policies and developments in smart grids
CO-2	Develop concepts of smart grid technologies in hybrid electrical vehicles etc
CO-3	Understand smart substations, feeder automation, GIS etc

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CO-4	Analyze micro grids and distributed generation systems
CO-5	Analyze the effect of power quality in smart grid and to understand latest developments in ICT for smart grid

Course Code: 17221104	
Course Title: Power system operation and control	
CO-1	Determine the unit commitment problem for economic load dispatch
CO-2	Get the knowledge of load frequency control of single area and two area systems
CO-3	Know the effect of generation with limited energy supply.
CO-4	Determine the interchange evaluation in interconnected power systems
Course Code: 17221161c	
Course Title: Advance digital processing	
CO-1	Understand neural networks and, analyze different types of neural networks.
CO-2	Design training algorithms for neural networks
CO-3	Develop algorithms using genetic algorithm for optimization.
CO-4	Analyze and, design fuzzy logic systems.
CO-5	Apply AI Techniques in electrical engineering
Course Code: 17221161d	
Course Title: Artificial Intelligence Techniques	
CO-1	Understand neural networks and, analyze different types of neural networks.
CO-2	Design training algorithms for neural networks
CO-3	Develop algorithms using genetic algorithm for optimization.
Course Code: 17221162c	
Course Title: Advanced Electro Magnetic Fields	
CO-1	know about analysis of electrostatic fields and properties of potential gradients
CO-2	know about the dielectric boundary conditions and electric stress control and optimization and time varying fields
Course Code: 17221162a	
Course Title: High Voltage Power Apparatus and Diagnostics	
CO-1	Team power transformer, types of insulation material
CO-2	Measure tan delta and capacitance of transformer oil.
CO-3	To Know the concept of moisture in transformer oil and paper and partial discharges
CO-4	To know degree of polymerization

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CO-5	To know concept of Fourier Transformer and frequency response analysis of transformer winding

Course Code: 17221162b	
Course Title: Collision Phenomena in plasma Science	
CO-1	Understand the collision phenomena in different materials
CO-2	Know Transition from Streamer to Townsend mechanisms of breakdown
CO-3	Understand Electric glow discharge and plasma glow discharge.
Course Code: 17221111	
Course Title: High Voltage Laboratory	
CO-1	Design the various testing procedures of various insulators
CO-2	Design the procedure for calibration of tong tester
CO-3	Compute the breakdown strength of dielectric coil
CO-4	Determine the leakage current of various insulators

Course Outcomes for First Year Second Semester Course	
Course Code: 17221201	
Course Title: High Voltage Testing Techniques	
CO-1	Understand different testing procedures on electrical Insulating materials, Insulation Systems
CO-2	Learn the different testing techniques adopted on electrical power apparatus
Course Code: 17221203	
Course Title: Surge Phenomenon and Insulation Co-ordination	
CO-1	Understand line concepts of travelling waves and their behavior in transmission systems
CO-2	Understand lighting phenomena and over voltages in power systems
CO-3	Understand the behavior of the transformer when surge voltages are induced in
CO-4	Understand the insulation coordination between different protecting and protective devicesin the power system
Course Code: 17221263a	
Course Title: Partial Discharges in High Voltage Equipment	
CO-1	Know Types of partial discharge that occurs in the insulation systems
CO-2	Understand Detection of discharges using different detection circuits.
CO-3	Understand Location of partial discharge in electrical apparatus and systems
Course Code: 17221204	
Course Title: Advanced Power System protection	
CO-1	Know the classifications and applications of static relays.
CO-2	Understand the application of comparators.

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CO-3	Understand the static version of different types of relays
CO-4	Understand the numerical protection techniques
Course Code: 17221263c	
Course Title: Pulse Power Engineering	
CO-1	Know Various energy storage devices, repetitive generators and cumulative pulse lines
CO-2	Know Pulse forming networks and their applications
CO-3	Know Pulse power generators
Course Code: 17221202	
Course Title: High voltage Alternating Current Transmission	
CO-1	Calculate the transmission line parameters
CO-2	Calculate the field effects on EHV and UHV AC lines.
CO-3	Determine the corona, RI and audible noise in EHV and UHV lines
CO-4	Analyze voltage control and compensation problems in EHV and UHV transmission systems

Course Code: 17221263b	
Course Title: High voltage systems using Electromagnetic Transients Program Analysis	
CO-1	Understand the severity of over voltages due to faults on a given power system
CO-2	To limit the effects of lightning over voltages in power systems
CO-3	Understand the various transient over voltages and their effects on power system
Course Code: 17221264a	
Course Title: Reactive power compensation and Management	
CO-1	Leam various load compensations.
CO-2	Obtain the mathematical model of reactive power compensating devices
CO-3	Get application of reactive power compensation in electrical traction & arc fumaces.
Course Code: 17221264b	
Course Title: Power system deregulation	
CO-1	Understand of operation of deregulated electricity market systems
CO-2	Know Typical issues in electricity markets
CO-3	Analyze various types of electricity market operational and control issues
Course Code: 17221264c	
Course Title: Flexible ac transmission Systems	
CO-1	Know the performance improvement of transmission system with facts
CO-2	Get the knowledge of effect of static shunt and series compensation Know the effect of UPFC

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CO-3	Know the effect UPFC
CO-4	Determine an appropriate facts device for different types of applications
Course Code: 17221211	
Course Title: Simulation Laboratory	
CO-1	Describe structure of digital filters
CO-2	Design digital filters different techniques
CO-3	Understand the implementation aspects of signal processing algorithms
CO-4	Know the effect of finite word length in signal processing.
CO-5	Analyze different power spectrum estimation techniques

Course Outcomes for Second Year First Semester Course	
Course Code: 17221311	
Course Title: Comprehensive viva voce	
CO-1	Identify a current problem through literature/field/ case studies and define the background objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/process.
CO-3	Implement and evaluate the technology at the laboratory level.
Course Code: 17221312	
Course Title: Seminar-I	
CO-1	Identify a current problem through literature/field/ case studies and define the background Objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/process.
CO-3	Implement and evaluate the technology at the laboratory level.
CO-4	Write report and present it effectively.
Course Code: 17221313	
Course Title: Project work-I	
CO-1	Identify a current problem through literature/field/ case studies and define the background objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/process.
CO-3	Implement and evaluate the technology at the laboratory level.
Course Outcomes for Second Year Second Semester Course	
Course Code: 17221411	
Course Title: Seminar-II	
CO-1	Identify a current problem through literature/field/ case studies and define the background objectives and methodology for solving the same.

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CO-2	Analyze, design and develop a technology/process.
CO-3	Implement and evaluate the technology at the laboratory level.
CO-4	Write report and present it effectively.
Course Code: 17221412	
Course Title: Project work-II	
CO-1	Identify a current problem through literature/field/ case studies and define the background objectives and methodology for solving the same.
CO-2	Analyze, design and develop a technology/process.
CO-3	Implement and evaluate the technology at the laboratory level.
CO-4	Write report and present it effectively.

GRMT 17 M.Tech VLSI (Electronics Communication Engineering)

Department Vision:

Create an educational environment to mound the students to meet the challenges of modern Electronics & Communication industry through state of the art Technical knowledge and Innovative experimental Approaches.

Department Mission:

1. To create learning, development and testing environment to meet ever challenging needs of the Electronic industry
2. To create entrepreneurial environment and industry Interaction for Mutual benefit
3. To become a global partner in training human resources in the fields of chip design, instrumentation and networking
4. To associate with internationally reputed Institutions for Academic excellence and collaborative Research

Program Educational Objectives (PEOs) :

PEO1	To prepare students with excellent comprehension of basic Sciences, mathematics and engineering subjects facilitating them to gain employment or pursue postgraduate studies with an appreciation for lifelong learning.
PEO2	To train students with problem solving capabilities such as analysis and design with adequate practical skills wherein they demonstrate creativity and innovation that would enable them to develop state of the art equipment and technologies of multidisciplinary nature for societal development.

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Program Specific Outcomes (PSO's):

PSO1	Analyze and design analog and digital circuits or systems for a given specification and function.
PSO2	Implement functional blocks of hardware-software co-designs for signal processing and communication applications.

Program Outcomes (POs): Engineering Graduates will be able to:

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

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Course Outcomes for First Year First Semester Course	
Course Code: 17242101	
Course Title: DIGITAL SYSTEM DESIGN	
CO-1	To understand the various techniques and algorithms used for the minimization of switching functions.
CO-2	To get knowledge on PLD's and to understand the designing ,configuring and minimization techniques of PLA's.
CO-3	To realize, design and implement various large scale digital system according o modern requirements.
CO-4	To identify and locate various faults present in combinational and sequential circuits and correct them.
CO-5	To study fault detection and location in sequential circuits.
Course Code: 17242102	
Course Title: VLSI TECHNOLOGU AND DESIGN	
CO-1	Use the electric CAD tools to build schematic entry, Layout.
CO-2	Able to do circuit design and simulate the circuits using anyone of the SPICE.
CO-3	Implement the logic circuits using MOS and CMOS technology.
CO-4	Analyse various circuit configurations and their applications.
CO-5	Analyze the merits of circuits according to the technology and applications change.
Course code:17242103	
Course Title: CM0S ANALOG IC DESIGN	
CO-1	Understand fabrication structure of MOS and CMOS and its functioning.
CO-2	Understand concepts of delay calculations and concerned parameters.
CO-3	Understand designing concepts of amplifiers.
CO-4	Understanding designing concepts of OPAMP amplifiers and its associated circuits.
CO-5	Understanding designing concepts of comparators.
Course Code: 17242104	
Course Title: HARDWARE SOFTWARE C0-DESIGN	
CO-1	Understand the basics of hardware software co-design.
CO-2	How to select a target architecture and how to prototype is built and how emulation of a prototype is done.
CO-3	Acquire knowledge about compilation technologies and compile development environment.
CO-4	Formulate design specifications and perform design verifications
CO-5	Understand the importance of system level specifications languages and multi-language co-simulation.

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Course code:17242111	
Course Title: VLSI LAB	
CO-1	Students are required to design logic circuits to perform experiments.
CO-2	To verify and perform the logical and functional operations.
CO-3	To perform the analysis with appropriate synthesizer and then verify the implemented logic.
CO-4	Students are required to acquire knowledge in both ilex and mentor graphics.
FIRST YEAR SECOND SEMESTER	
Course code:17242202	
Course Title: CMOS MIXED SIGNAL DESIGN CIRCUIT	
CO-1	Understand the theory of discrete-time signal processing and its implementation using analog techniques.
CO-2	Understand the operation of phase locked loops and frequency synthesizers.
CO-3	Understand the principle of analog to digital conversion techniques.
CO-4	Understand the principle of digital to analog conversion techniques.
CO-5	Understand mixed signal design and capable of carrying out a project by using the above mixed signal circuits.
Course code:17242203	
Course Title: EMBEDDED REAL TIME OPERATING SYSTEM	
CO-1	Understand OS concepts and RTOS concepts.
CO-2	Understand programming concepts of some of the most widely used RTOS.
CO-3	Understand use of real-time operating systems in embedded software.
CO-4	Understand how to create program image for the target embedded systems.
CO-5	Understand programming in RT Linux.
Course code:17242204	
Course Title: DESIGN FOR TESTABILITY	
CO-1	Create understanding of the fundamental concepts of testing in VLSI design.
CO-2	Perceiving trends affecting testing.
CO-3	An ability to know design verification and test evaluation.
CO-4	Employ the simulation algorithms for verification and validations.
CO-5	An ability to know the high level testability measures and scan methods.

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Course code:17242261(a)	
Course Title: DIGITAL SIGNAL PROCESSING	
CO-1	Comprehends the knowledge and concepts of digital signal processing technologies.
CO-2	Acquire knowledge of DSP computational building blocks and knows how to achieve speed in DSP architecture or processor.
CO-3	Acquire knowledge about various addressing modes of DSP TMS320C54XX and are able to program DSP processor.
CO-4	Acquire knowledge of Analog devices family of DSP devices.
CO-5	Discuss about interfacing of serial and parallel communication devices.
Course code:17242211	
Course Title: EMBEDDED SYSTEM LAB	
CO-1	Students are required to write the program using C-language according to the experiment requirements.
CO-2	The experiments are required to develop the algorithms, flow diagrams, source code and perform the compilation.
CO-3	The programs that are developed for the implementation should be the level at embedded system design.
CO-4	Experiment requirements are RTOS library functions and macros ARM-926 develper kits and ARM-cortex

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Program Educational Objectives (PEOs):

PEO1	To prepare students with excellent comprehension of basic Sciences, mathematics and engineering subjects facilitating them to gain employment or pursue postgraduate studies with an appreciation for lifelong learning.
PEO2	To train students with problem solving capabilities such as analysis and design with adequate practical skills wherein they demonstrate creativity and innovation that would enable them to develop state of the art equipment and technologies of multidisciplinary nature for societal development.

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2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilitiesrelevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate theknowledge of, and need for sustain able development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a member orleader in diverse teams, and in multidisciplinary settings.

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10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a Member and leader in a team, to manage projects and in multi disciplinaryenvironments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes for First Year First Semester Course	
Course Code: 17241101	
Course Title: DIGITAL SYSTEM DESIGN	
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CO-2	To get knowledge on PLD's and to understand the designing configuration and minimization techniques on PLA's
CO-3	To realize, design and implement various large scale digital systems according to modern requirements.
CO-4	To identify and locate various faults present in combinational and sequential circuits and correct them.
Course Code: 17241102	
Course Title: DETECTION AND ESTIMATION OF SIGNAL	
CO-1	Learn processing of the analog signal to discrete format in depth.
CO-2	Understand Curve fitting.
CO-3	Know the process of Linear filtering.
CO-4	Understand Spectral analysis of random signals
CO-5	Know the detection and estimation of signals.
Course code:17241103	
Course Title: DIGITAL DATA COMMUNICATIONS	
CO-1	To provide knowledge about Digital data communications.
CO-2	To understand various Digital Modulation scheme
CO-3	To understand various concept on protocols and standards.
CO-4	To understand various concept on interfaces and Modems.
CO-5	To provide knowledge about error detection and error correction.
Course Code: 17241104	
Course Title: ADVANCED DIGITAL SIGNAL PROCESSING	
CO-1	Analyzing methods for frequency analysis of the signal using DFT

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CO-2	Developing algorithms for the fast Fourier and Z transform.
CO-3	Developing IIR filters using different techniques and structures.
CO-4	Designing of FIR filters using different approximation and methods.
CO-5	Understanding the Sampling rate conversion methods.

Course code:17241111	
Course Title: SYSTEMS DESIGN AND DATA COMMUNICATION LAB	
CO-1	The students require to design the logic to perform.
CO-2	Students perform the following experiments using necessary industry standard simulator.
CO-3	Perform the analysis with appropriate synthesizer and to verify the implemented logic
CO-4	Understanding the systems and design communications.
CO-5	To have a complete understanding systems and design communications in lab.
FIRST YEAR SECOND SEMESTER	
Course code:17241201	
Course Title: CODING THEORY AND APPLICATIONS	
CO-1	To understand the role of information theory for an efficient, error free and secure delivery of information using binary data segment
CO-2	To have a complete understanding of error-control coding
CO-3	To understand encoding and decoding of digital data systems
CO-4	To introduce the for the generation of these codes and their decoding
CO-5	To have a detailed knowledge of compression and decompression techniques
Course code:17241203	
Course Title: IMAGE AND VIDEO PROCESSING	
CO-1	To provide basics of image processing
CO-2	To understand the concept of how to enhance the Image and restoration of image
CO-3	To get the knowledge on image segmentation and image compression
CO-4	Underlying the concept of video processing
CO-5	To provide knowledge on different video coding techniques and estimation
Course code:17241204	
Course Title: WIRELESS COMMUNICATIONS AND NETWORKS	
CO-1	To provide knowledge about cellular system design.
CO-2	To understand the radio wave propagation.
CO-3	To get knowledge on multipath propagation and fading.

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CO-4	To understand the concept of equalizers and types.
CO-5	To provide knowledge about wireless networks.

Course code:17241261(A)	
Course Title: CMOS ANALOG AND DIGITAL IC DESIGN	
CO-1	To provide knowledge about MOS design and small signal modelling of MOS devices.
CO-2	To get knowledge on both combinational and sequential MOS device modelling circuits.
CO-3	Underlying the concept dynamic logic circuits.
CO-4	To provide knowledge about semiconductor memories.
CO-5	To understand the concept of Analog CMOS Sub- circuits.
Course code:17241211	
Course Title: ADVANCED COMMUNICATIONS LAB	
CO-1	To understand the communications.
CO-2	To get knowledge on advanced level of communications.
CO-3	Underlying the concept dynamic communications
CO-4	To provide knowledge about advanced communications.
CO-5	To understand the concept of communications in advanced levels.

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CO-4	To understand the concept of equalizers and types.
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Course code:17241261(A)	
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CO-5	To understand the concept of Analog CMOS Sub- circuits.
Course code:17241211	
Course Title: ADVANCED COMMUNICATIONS LAB	
CO-1	To understand the communications.
CO-2	To get knowledge on advanced level of communications.
CO-3	Underlying the concept dynamic communications
CO-4	To provide knowledge about advanced communications.
CO-5	To understand the concept of communications in advanced levels.

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