

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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Godavari Institute of Engineering & Tech.(A)
NH-16, Chaitanya Knowledge City
RAJAHMUNDRY-533296

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.
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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

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|-------------|---|
| 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 writing 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 mitigation
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 ethical 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 entrepreneurs in their chosen 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 and business 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 the required form
PSO 4	Graduates will be 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 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 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: 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

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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

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, diffraction and 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
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 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 develop the 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 energy in 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 develop the 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 21 st 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 Semester Course

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 with relevant 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

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Course Outcomes for Second Year Second Semester Course

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 starting 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 X_d/X_q ratio of alternator and assess the performance of three-phase synchronous motor
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, flip-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
Course Code: 201EE504A	
Course Title: Digital Control Systems	

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CO-1	Learn the advantages of discrete time control systems and the know 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 operation environments.
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 Semester Course

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 Source Converters
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.

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

1	Apply fundamental knowledge of Science, Mathematics and Engineering principles to solve 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.

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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: 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.
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.
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 Clausius - 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 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 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 mould 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 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 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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CO-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	
Course Title: 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	
Course Title : 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.
CO-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 bistable, monostable and astable 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
CO-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
CO-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.
CO-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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NH-16, Chaitanya Knowledge City
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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 ENGLISH LAB	
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

Course Title: 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 Control 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 components and 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 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.

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 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-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 Clausius - 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: FUNDAMENTALS 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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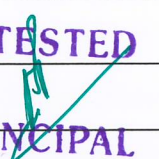
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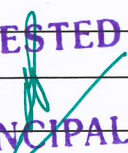
CO-5	Evaluation of properties of perfect gas mixtures
Course Code: 201AM403	
Course Title: AUTOMOBILE ENGINES	
CO-1	Analyse and conduct the experiments of the automotive SI and CI engines
CO-2	Investigate the thermochemistry of air-fuel mixtures
CO-3	Compare the properties and combustion of gasoline, 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 ANALYSIS LAB

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 in 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, Shaper, Planner etc.
CO-3	Identify various machine tools Viz, Lathe, Shaper, 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-10 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 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.

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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 Clausius - 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	
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: 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 21 st 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 Outcomes (Cos) of all courses of all programs offered by the Institution

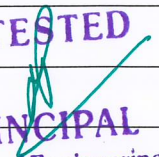
Course outcomes for First Year First Semester Course	
Course Code:201HB101	
Course Title: Mathematics - I	
CO1:	Transform the knowledge of solving system of linear equations using matrices.
CO2:	Evaluate nature of the Quadratic form.
CO3:	Acquire the knowledge maxima and minima of function of several 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: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, and create audio files and podcasts
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 Stylesheet
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, legislature 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-government
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 on numpy 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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