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

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PEOs, PSOs & COs

GRMT-20 M.Tech Civil Engineering

Department Vision:

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

Department Mission:

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

Program Educational Objectives (PEOs):

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

Program Educational Objectives (PSOs):

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

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

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

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

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

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

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

GRMT-20 M.Tech Power Systems

Department Vision:

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

Department Mission:

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

Program Educational Objectives (PEOs):

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

Program Specific Outcomes (PSO's):

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

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

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

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

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

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Course Title: Collision Phenomena in Plasma Science	
CO-1	Understand the collision phenomena in different materials
CO-2	Know Transition from Streamer to Townsend mechanisms of breakdown
CO-3	Understand Electric glow discharge and plasma glow discharge

CourseCode:20221162C	
Course Title: Advanced Electro Magnetic Fields	
CO-1	Know about analysis of electro static fields and properties of potential gradients
CO-2	Knowaboutthedielectricboundaryconditionsandelectricstresscontrolandoptimizationa nd time varying fields

CourseCode:20221103	
Course Title: Research Methodology	
CO-1	Understand some basic concepts of research and its methodologies
CO-2	Identify appropriate research topics
CO-3	Select and define appropriator search problem and parameters
CO-4	Write are search report, thesis and research proposal(grants)

CourseCode:20221111	
Course Title: Simulation Laboratory–I	
CO-1	Distinguish between different load flow methods
CO-2	Analyze Y-bus &Z- bus algorithm
CO-3	Analyze symmetrical &unsymmetrical faults
CO-4	Understand importance of load flow control ,Economic load dispatch and transients ability

CourseCode:20221112	
Course Title: High Voltage Laboratory	
CO-1	Design the various testing procedures of various insulators
CO-2	Design the procedure for calibration of tongtester
CO-3	Compute the break down strength of dielectric coil
CO-4	Determine the leak age current of various insulators

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

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

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

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

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GRMT-20 M.Tech Mechanical Engineering

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

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

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

Program Educational Objectives(PEOs):

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

Program Specific Outcomes(PSO's):

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

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

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

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

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

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

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

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

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GRMT-20 M.Tech VLSI

Department Vision:

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

Department Mission:

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

Program Educational Objectives (PEOs) :

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

Program Specific Outcomes (PSO's):

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

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

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

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

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

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

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