GMR Institute of Technology

An Autonomous Institute Affiliated to JNTU-GV Vizianagaram
All UG Courses are accredited by **NBA**
Institute Accredited by **NAAC** with "**A**" grade (3rd cycle)
Ranked 188th in NIRF-2022

GMRIT

Training Tomorrow's
Engineers Today

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Additional Information

2.6.1. Teachers and students are aware of the stated Programme and course outcomes of the Programmes offered by the institution. **List of POS and COs**

Department of Civil Engineering

Academic Year 2023-24

Program Outcomes (POs):

Engineering graduate will be able to:

PO 1:   Apply the knowledge of basic sciences and fundamental engineering concepts in solving civil engineering problems (**Engineering knowledge**)

PO 2:   Identify and define civil engineering problems and investigate to analyze and interpret data to arrive at substantial conclusions. (**Problem analysis**)

PO 3:   Propose appropriate solutions for engineering problems complying with functional constraints such as economic, environmental, societal, ethical, safety and sustainability in accordance with Indian standard codes of practices. (**Design/development of solutions**)

PO 4:   Perform investigations, design and conduct experiments, analyze and interpret the results to provide valid conclusions. (**Conduct investigations of complex problems**)

PO 5:   Select/develop and apply appropriate techniques and IT tools to analyze, design and scheduling of activities with an understanding of the limitations and successfully implement and adopt to technological changes in civil engineering with intervention of IT industries (**Modern tool usage**)

PO 6:   Give reasoning and assess societal, health, legal and cultural issues with competency in professional engineering practice. (**The engineer and society**)

PO 7:   Demonstrate professional skills and contextual reasoning to assess environmental/societal issues for sustainable development. (**Environment and sustainability**)

PO 8:   Demonstrate knowledge of professional and ethical practices. (**Ethics**)

PO 9:   Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary situations. (**Individual and team work**)

PO 10: Communicate effectively with respect to oral, written and graphical communication (**Communication**)

PO 11: Demonstrate and apply engineering & management principles in their own / team projects in multidisciplinary environment. (**Project management and finance**)

PO 12: Recognize the need for, and have the ability to engage in independent and lifelong learning. (**Life-long learning**)

Program Specific Outcomes (PSOs):

Engineering graduate will be able to:

PSO 1: Demonstrate the quality and suitability of construction materials (**Program Specific**)

PSO 2: Ability to apply the practical aspect of analysis, design and safe construction practices (**Program Specific**)

21MA303 Numerical Methods

3 0 0 3

Course Outcomes

1. Utilize numerical techniques to find approximate solutions of Algebraic and Transcendental Equations.
2. Apply method of least squares to fit the best curve for the given data.
3. Make use of the concepts of interpolation to estimate the unknown functional values.
4. Examine the technique of numerical methods to find the derivative of a function.
5. Evaluate the definite integrals using numerical methods.
6. Solve ordinary differential equations using numerical methods.

21CE302 Building Materials and Concrete Technology

3 0 2 4

Course Outcomes

1. Illustrate the various characteristics of building materials and their applications in the construction industry.
2. Interpret the procedures and results of testing for various construction materials.
3. Identify suitable finishing materials for various building elements.
4. Design concrete mix proportions as per the IS code.
5. Apply testing methods for fresh concrete to prepare workable concrete.
6. Evaluate and infer the properties of hardened concrete.

21CE303   Building Planning and Drawing

3 0 2 4

Course Outcomes

1. Utilize building byelaws effectively in diverse building scenarios, ensuring compliance with regulatory standards and legal requirements.
2. Apply the concepts of FAR and FSIin different building types.
3. Evaluate and analyze the preliminary prerequisites for residential buildings.
4. Examine and elucidate the specific planning requisites applicable to different types of buildings.
5. Determine the minimum project duration by applying the principles of critical path methods.
6. Analyze the project durations and examine the probability of project completion using the PERT technique.

21CE304 Fluid Mechanics

3 0 0 3

Course Outcomes
1. Understand the importance of fluid properties and their influence on fluid motion.
2. Apply the principles of total pressure, center of pressure and buoyancy in the design of different components in hydraulic structures.
3. Explain the principles of fluid kinematics and dynamics in different fluid flow problem.
4. Understand the concepts of laminar flow, turbulent flow and boundary layer theory.
5. Solve various problems related to fluid flow through pipes.
6. Explain the fundamental principles of fluid motion in the measurement of flow.

21CE305 Solid Mechanics I

3 0 0 3

Course Outcomes
1. Sketch the free body diagram and compute the resultant of a given system of forces
2. Estimate the centroid of composite figures and bodies
3. Estimate the moment of inertia of composite figures and bodies
4. Contrast between normal, shear stresses and various elastic constants
5. Examine the variation of bending moment and shear force at every cross section of a beam under all practical loading cases
6. Examine the variation of flexural stress for various cross section of a beam under all practical loading cases.

21CE306 Surveying

3 0 0 3

Course Outcome
1. Explain the conventional methods of surveying.
2. Apply the concept of levelling to prepare the contour maps. Interpret survey data and compute areas and volumes.
3. Apply the concept of theodolite in angular measurement and tacheometer in elevation and distance between an object.
4. Classify different types of curves in road and railway surveying.
5. Understand the objectives,equipments and methods for Hydrographic Surveying.
6. Make use of advanced equipment to conduct a survey works.

21CE307 Solid Mechanics Laboratory

0 0 3 1.5

Course Outcomes
1. Demonstrate the basic knowledge of the mechanical properties of materials
2. Estimate compressive strength of wood, concrete, brick materials and decide their suitability for the construction purpose
3. Evaluate the tensile strength and comment on their usage in reinforced concrete structures
4. Determine the impact resistance of steel used in construction works
5. Determine the young's modulus of wood/steel materials
6. Determine shear modulus of rigidity for helical spring

21CE308 Surveying Laboratory

0 0 3 1.5

Course Outcomes
1. Utilize conventional survey equipment to measure distance and bearings.
2. Utilize theodolite to find horizontal angles, vertical angles, heights and distances using trigonometric levelling.
3. Utilize theodolite to find vertical angle and find distance and elevation using tacheometric surveying.

4. Evaluate differences in elevation, draw profiles & sections further to draw contour plots using levelling instrument.
5. Take part in calculation of area, missing measurements and elevation using Total station
6. Plot the hand-held Global Positioning System global coordinate in google earth software.

21CE401 Hydraulics and Hydraulic Machinery

3 0 0 3

Course Outcomes
1. Explain the behavior of flow in open channels under various flow conditions.
2. Develop empirical relationships among the physical variables associated with the flow phenomenon in both model and prototype scenarios
3. Determine the hydrodynamic forces exerted by the fluid jet on flat, inclined, and curved vanes.
4. Develop velocity triangles to enhance the understanding of the operations of various turbines and pumps.
5. Design turbines considering diverse hydraulic conditions.
6. Evaluate the performance characteristics of turbines and pumps operating under various conditions.

21CE402 Soil Mechanics

3 0 0 3

Course Outcomes

1. Outline the significance of geotechnical engineering
2. Examine and determine physical properties of soil
3. Analyze the hydraulic conductivity in soils due to seepage
4. Apply laboratory compaction tests, Analyze the stress distribution due to different types of loading.
5. Determine one-dimensional consolidation characteristics of fine-grained soils under vertical load
6. Determine the shear strength of soils and describe the differences between drained and undrained shear strength.

21CE403 Solid Mechanics II

3 0 0 3

Course Outcomes
1. Sketch the shear stress distribution diagram for various beam sections and to determine the diameter of the shaft subjected to the pure torsion
2. Identify the principal planes and principal stresses on an element
3. Determine the safe stresses using failure theories
4. Design the helical spring subjected to loading and to determine the buckling loads of columns
5. Compute the thickness of cylinder subjected to longitudinal, hoop and radial stresses
6. Assess the resultant stresses and stability in the case of chimneys, retaining walls

Department of Electrical and Electronics Engineering

Program Outcomes (POs) and Course Outcomes (COs)

Program Outcomes (POs)

1. Apply the knowledge of basic sciences and fundamental engineering concepts in solving civil engineering problems (Engineering knowledge)

2. Identify and define civil engineering problems and investigate to analyze and interpret data to arrive at substantial conclusions. (Problem analysis)

3. Propose appropriate solutions for engineering problems complying with functional constraints such as economic, environmental, societal, ethical, safety and sustainability in accordance with Indian standard codes of practices. (Design/development of solutions)

4. Perform investigations, design and conduct experiments, analyze and interpret the results to provide valid conclusions. (Conduct investigations of complex problems)

5. Select/develop and apply appropriate techniques and IT tools to analyze, design and scheduling of activities with an understanding of the limitations and successfully implement and adopt to technological changes in civil engineering with intervention of IT industries (Modern tool usage)

6. Give reasoning and assess societal, health, legal and cultural issues with competency in professional engineering practice. (The engineer and society)

7. Demonstrate professional skills and contextual reasoning to assess environmental/societal issues for sustainable development. (Environment and sustainability)

8. Demonstrate knowledge of professional and ethical practices. (Ethics)

9. Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary situations. (Individual and team work)

10. Communicate effectively with respect to oral, written and graphical communication (Communication)

11. Demonstrate and apply engineering & management principles in their own / team projects in multidisciplinary environment. (Project management and finance)

12. Recognize the need for, and have the ability to engage in independent and lifelong learning. (Life-long learning)

Program Specific Outcomes (POs)

1. Analyse, design and implement control of electrical systems in any problem/application of electrical/electronic (s) engineering. (Program Specific).

2. Ability to design, develop, and implement electrical and electronic systems for electric vehicles (EVs), smart grids, and green energy technologies. (Program Specific).

Course Outcomes (COs)

21EE302 DC Machines and Transformers
Course Outcomes
1. Illustrate the constructional features and working of DC machine
2. Outline the various starting, speed control and testing methods of DC motors
3. Analyze the performance of DC machine
4. Illustrate the constructional features and working of transformer
5. Outline the testing methods of transformer
6. Analyze the performance of transformer

21EE303 Electrical Circuit Analysis
Course Outcomes

1. Apply the concept of RLC circuits for various applications
2. Summarize the concepts of three phase circuits
3. Apply network theorems for various applications
4. Illustrate transient response of RLC circuits for DC and AC excitations in time and frequency domain
5. Interpret various parameters for a given two port networks
6. Apply concept of graph theory to Electrical networks.

21EE401 AC Machines
Course Outcomes
1. Illustrate the constructional features and working of induction motor
2. Analyze the performance of induction motor
3. Outline the various starting, speed control and testing methods of induction motors
4. Illustrate the constructional features and working of synchronous machine
5. Outline the regulation methods of an alternator
6. Analyze the performance of synchronous machine

21EE402 Linear and Digital Integrated Circuits
Course Outcomes

1. Infer the DC and AC characteristics of operational amplifiers and its effect on output
2. Elucidate and Design the linear applications of an Op-Amp
3. Elucidate and Design the non-linear applications of an Op-Amp
4. Identify a suitable tool (Boolean theorems, K-maps, Tabular etc.) to minimize Boolean expressions
5. Design and implement the combinational logic circuits
6. Design and implement the sequential logic circuits

21EE502 Control Systems

Course Outcomes

1. Build mathematical models of control systems in continuous time
2. Outline the system using block diagram and signal flow graph techniques
3. Analyze the transient and steady state performances of a control system
4. Analyze the stability of a system using time domain and frequency domain techniques
5. Develop different controllers in time/frequency domain
6. Illustrate state space modeling and compute the controllability and Observability for the given system

21EE503 Electrical Drives

Course Outcomes

1. Summarize the speed torque characteristics of different motors
2. Analyze speed control and braking methods of converter fed drives.
3. Examine the speed torque characteristics of chopper fed dc drives
4. Analyze the performance of converter fed induction motor from stator side.
5. Analyze the performance of induction motor from rotor side
6. Outline the operation of converter fed synchronous motor drives

21EE602 Power System Analysis and Control

Course Outcomes

1. Illustrate the per-unit representation for given power system network
2. Analyze power system behavior under short circuit conditions
3. Make use of load flow and stability studies in power system networks
4. Model load frequency control components
5. Analyze the various economic aspects of power plant operations
6. Examine the behavior of power system for change in load demand

21EE603 Utilization of Electrical Energy

Course Outcomes

1. Identify suitable motor based on application
2. Summarize electric heating and welding methods
3. Design interior and exterior lighting systems
4. Apply electrolytic & electrolysis process in chemical manufacturing
5. Summarize the principles of refrigeration and air-conditioning
6. Analyze the performance of traction systems

20EEC13 Battery Management Systems

Course Outcomes

1. Outline the battery management system in detail.
2. Summarize the requirements of battery management system.
3. Outline the State of Charge model in detail.
4. Illustrate Cell Balancing model in detail.
5. Demonstrate the battery charging algorithms.
6. Summarize Battery charging standards and safety Issues.

20EEC23 Hybrid Renewable Energy Systems Design

Course outcomes
1. Outline hybrid energy system
2. Identify the various converter topologies for hybrid energy systems.
3. Identify the various control strategies in the hybrid system
4. Outline the planning and modeling of solar and wind energy systems
5. Summarize the storage and control system for hybrid renewable energy systems
6. Examine the application of storage and control system for hybrid model

20EE014 Power System Deregulation

Course Outcomes
1. Outline the components of deregulated systems.
2. Summarize deregulated model in detail.
3. Identify the need of power system restructuring in deregulation.
4. Compute the market power mitigation techniques.
5. Summarize the total transfer capability in detail.
6. Identify the various transmission open access issues in competitive market

20EE017 Sustainable Energy

Course Outcomes
1. Understand various terms related to sustainability
2. Understand the estimation and valuation of different energy sources
3. Identify the key issues and lessons learned for sustainable development
4. Outline the technical performance of sustainability
5. Summarize the interaction of energy systems with the environment
6. Identify the environmental benefits and implications of sustainable energy

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HoD-EEE

PO 10 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 (Communication)

PO 11 Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments (Project management and finance)

PO 12 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 (Life-long learning)

Programme Specific Outcomes (PSOs):

PSO 1 Demonstrate the knowledge and application of Geometric modelling, Design, Analysis and Simulation of Mechanical Engineering Systems (Program Specific)

PSO 2 Ability to apply the advanced concepts of thermal and manufacturing engineering in solving industry problems (Program Specific)

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Course Outcomes

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Semester: III

Course Name: Engineering Materials and Manufacturing Technology

Course Code: 21ME301

1. Understand the properties and applications of Ferrous and Non-Ferrous alloys
2. Interpret proper moulds and gating system design
3. Choose proper melting furnace
4. Identify and distinguish the process details of metal joining processes
5. Explain the characteristics of cold and hot working processes
6. Understand the principle of press working of metals

Semester: III

Course Name: Fluid Mechanics and Hydraulic Machines

Course Code: 21ME304

1. Define fluid properties and explain the measurement of pressure
2. Apply conservation of mass principle to fluid flow problems
3. Apply Bernoulli's equation to fluid flows and momentum equation to find force on pipe bend

4. Explain major and minor losses of flow through pipes

5. Analyze the performance of hydraulic turbines

6. Explain the working principles of centrifugal and reciprocating pumps and find their performance

Semester: III

Course Name: Fluid Mechanics and Hydraulic Machines Lab

Course Code: 21ME307

1. Solve the co-efficient of discharge from experimental data by utilizing Venturi, Orifice and Rota meters

2. Recognize the friction factor decreased as the Reynolds number of the fluid increased due to increasing velocity of the fluid

3. Identify & Calculate the Reynold's number for transition from laminar to turbulent flow

4. Accuracy of Bernoulli's assumptions and theorem by experimentally proving that the sum of the terms in the Bernoulli equation along a streamline always remains a constant

5. Make them understand the relation between force and rate of momentum flow in the jet on vanes

6. Impart knowledge for calculating performance analysis in turbines and pumps and can be used in power plants

Semester: IV

Course Name: Applied Thermodynamics

Course Code: 21ME401

1. Understand the construction and working principle associated with SI and CI Engines

2. Elaborate the working of IC engine auxiliary systems

3. List the stages of combustion in IC engines and analyze the engine combustion process

4. Evaluate the performance of IC engines

5. Categorize the effects of emission and its control

6. Estimate the various efficiencies of air compressors

Semester: IV

Course Name: Dynamics of Machinery

Course Code: 21ME402

1. Interpret static and dynamic force analysis of simpler planar mechanisms

2. Apply the principle of gyroscope and compute gyroscopic effect for aero planes and ships

3. Make use of the principle of gyroscope and interpret the stability for two wheelers and four wheelers

4. Summarize the working of important machine elements like clutches, brakes, flywheels and governors

5. Examine the balancing of rotating and reciprocating masses

6. Summarize free and forced vibrations

Semester: IV

Course Name: Mechanics of Solids Lab

Course Code: 21ME406

1. Evaluate the strength of various engineering materials

2. Calculate young's modulus of wood/steel materials

3. Find the stiffness and rigidity modulus of spring

4. Estimate the impact resistance of steel used in various engineering applications

5. Compare the compressive strength of wood/Concrete/Brick materials along and across the grains

6. Measure the deformations in various beam members

Semester: V

Course Name: Steam and Gas Turbines

Course Code: 20ME503

1. Interpret Rankine cycle

2. Explain the working of boilers and its performance parameters

3. Asses the performance of steam nozzles

4. Criticize on the performance of steam turbines

5. Explain the working of steam condensers and their performance parameters

6. Asses the performance of gas turbines

Semester: V

Course Name: Non- Traditional Machining and Forming Processes

Course Code: 20ME006

1. Outline the need for unconventional machining processes and their classification

2. Understand the underlying mechanism of mechanical energy processes

3. Summarize working principles of chemical machining and ECM processes

4. Explain working principles of EDM, EBM

5. Understand the underlying principle of LBM and PAM processes

6. Summarize the working principle of various forming and finishing processes

Semester: V

Course Name: Metal Cutting and Machine Tools lab

Course Code: 20ME507

1. Build simple features by performing basic turning operations on lathe

2. Develop simple features by performing basic operations on shaper and planer

3. Create features by making use of grooving, boring and reaming,

4. Demonstrate the features by making use of milling machine

5. Conducting for simple features by performing basic operations on thread cutting and knurling

6. Build the basic features by making use of Cylindrical Grinder and Surface.

VI Semester:

Course Name: Design of Machine Members-II

Course Code: 20ME601

1. Design of journal, ball and roller bearings subjected to static and dynamic loads

2. Analyze curved beams under static loads

3. Design of connecting rod, crank shaft, pistons and cylinders

4. Design of belt, rope and chain drives

5. Design of spur and helical gears

6. Design of power screws and springs

VI Semester:

Course Name: Mechatronics

Course Code: 20ME008

1. Explain different control methods used in the typical mechatronics systems

2. Infer signal condition and the hardware used for signal conditioning

3. Outline the use of common electrical and mechanical components to achieve precision in Mechanical, Electrical, Fluid & Thermal systems

4. Explain the need and working of interfacing circuits and their components

5. Illustrate the working principles of various electromechanical drives and micro controllers

6. Compare PLCs, and PMCs and their applications in Mechatronic systems

VI Semester:

Course Name: Heat Transfer Lab

Course Code: 20ME606

1. Find thermal conductivity of common metallic materials

2. Determine the amount of heat transfer between fluid and solid boundaries

3. Estimate the amount of heat exchanged between fluids in heat exchangers

4. Determine the emissivity and Stefan Boltzmann constant of radiative heat transfer

5. Evaluate heat transfer coefficient in natural and forced convections

6. Analyze the Fabricated simple heat transfer systems

VII Semester:

Course Name: Power Plant Engineering

Course Code: 19ME016

1. Explain the construction, working principles of steam and hydroelectric power plants.

2. Demonstrate the working principles of diesel and gas turbine power plants.

3. Explain the concepts of non-conventional energy sources.

4. Distinguish different technologies adopted in nuclear power plants.

5. Outline the pollution effects of different types of power plants.

6. Analyze the economics of power plants.

VII Semester:

Course Name: Total Quality Engineering

Course Code: 19ME016

1. Demonstrate the demining philosophy as a frame work for TQM

2. Identify customer needs to enhance the quality management

3. Appraise the employee's involvement critically for effective team work requirements

4. Describe several techniques of quality management tools

5. Describe several techniques of quality management tools

6. Apply benchmarking and FMEA processes for effective quality management

Semester VIII

Course Name: Quality Engineering

Course Code: 19ME015

1. Outline the quality engineering tools and techniques.

2. Demonstrate the philosophy and approach of TQM.

3. Apply benchmarking and FMEA processes for effective quality management.

4. Outline the contemporary trends in Quality Engineering & Management.

5. Use six sigma approach for various industrial applications.

6. Explain standards for total quality management in various service sectors.

Semester VIII

Course Name: Additive Manufacturing

Course Code: 19ME012

1. Explain the importance of AM in Manufacturing.

2. Distinguish different AM Technologies.

3. Illustrate STL file processing.

4. Select suitable materials for AM.

5. Analyze different methods for Post-processing of AM parts.

6. Explain the non-thermal and thermal AM techniques.

Signature of the HoD

Department of Electronics & Communication Engineering

List of Program Outcomes and Course Outcomes

List of Program Outcomes

- **PO1:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. (Engineering knowledge).

- **PO2:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. (Problem analysis)

- **PO3:** 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. (Design/development of solutions)

- **PO4:** 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. (Conduct investigations of complex problems)

- **PO5:** 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. (Modern tool usage)

- **PO6:** 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. (The engineer and society)

- **PO7:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. (Environment and sustainability)

- **PO8:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. (Ethics)

- **PO9:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. (Individual and team work)

- **PO10:** 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. (Communication)

- **PO11:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. (Project management and finance)

- **PO12:** 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. (Life-long learning)

- **PSO1:** Apply the knowledge of technological evolutions, model / characterize devices and design the integrated circuits to build analog and digital systems.

- **PSO2:** Understand and apply the fundamentals of communication and signal processing to develop systems wrapped with industry standard protocols and standards.

List of Course Outcomes

21EC301 Electronic Devices and Circuits

1. Explain operation of semiconductor devices, characteristics and their applications
2. Illustrate the characteristics of BJT and JFET
3. Construct different biasing circuits for BJT
4. Illustrate h-parameter representation and Hybrid-model of transistor
5. Analyse low frequency and high frequency single stage amplifiers
6. Construct multi stage amplifiers

21EC401 Analog and Digital Communications

1. Explain Analog Modulation & Demodulation techniques
2. Summarise the noise level in Analog communication systems
3. Demonstrate the operations of Transmitters and Receivers
4. Explain different pulse modulation techniques
5. Illustrate different digital modulation and demodulation techniques
6. Outline the operations of digital communication receivers

21EC402 Analog Electronic Circuits

1. Design Sinusoidal oscillators for a given frequency

2. Construct the feedback and power amplifiers

3. Demonstrate the operation of tuned amplifiers

4. Demonstrate the working of linear & nonlinear wave shaping circuits for given application

5. Construct Multivibrators to generate given frequency

6. Demonstrate the operation of different Time base circuits

21EC501 Linear and Digital IC Applications

1. Illustrate the characteristics and internal structure of Operational amplifier

2. Classify various configurations of differential amplifiers

3. Differentiate linear and non-linear applications of operational amplifier

4. Design various types of analog filters

5. Outline the operation and applications of IC 555 time and PLL

6. Compute the working of various types of ADCs and DACs

21EC502 Microprocessors and Microcontrollers

1. Assess the architecture and instructions of 8086 microprocessor

2. Demonstrate the application of addressing modes

3. Execute assembly language programs based on microprocessor

4. Assess the architecture and instructions of 8051 microcontroller

5. Execute assembly language programs based on microcontroller

6. Implement the interfacing of peripherals with microcontroller

Department of Computer Science and Engineering, GMRIT

Program Outcomes

Engineering graduate will be able to

PO 1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. (Engineering knowledge)

PO 2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. (Problem analysis)

PO 3: 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. (Design/development of solutions)

PO 4: 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. (Conduct investigations of complex problems)

PO 5: 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. (Modern tool usage)

PO 6: 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. (The engineer and society)

PO 7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. (Environment and sustainability)

PO 8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. (Ethics)

PO 9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. (Individual and team work)

PO 10: 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. (Communication)

PO 11: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. (Project management and finance)

PO 12: 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. (Life-long learning)

PSO1: Ability to apply the software engineering principles to meet automation of the process and service industries apart from the community utilities.

(Program Specific)

PSO2: Ability to design, develop and implement management systems, E-Commerce tools and Web Apps for product development. (Program Specific)

Course Outcomes

Semester 3

21MA304 - Probability and Statistics using Python

1. List the basic data structures of Python and various libraries of Python.
2. Illustrate basic probability axioms and apply Bayes' theorem related to engineering problems.
3. Differentiate between various distributions of random variables on given data.
4. Examine given dataset based on descriptive statistics.
5. Compare the null or alternative hypotheses using the suitable test statistic.
6. Choose appropriate curve fitting and correlation methods for a given data

21CS303 Data Structures

1. Describe the operations and implementation of List ADT
2. Comprehend the operations and implementation of Stack and Queue
3. Illustrate the applications of linear data structures
4. Describe the operations and implementation of hash table
5. Comprehend the operations and implementation of tree data structure
6. Illustrate the variations of tree data structure

Semester 4

21CS403 Computer Organization and Architecture

1. Interpret the functional architecture of computing systems.
2. Summarizethetypesofinstructionanditsmicrooperationwithaddressingmodes
3. Identify various arithmetic operations on fixed, floating point numbers and its representation
4. Illustrate the concepts of control unit design and I/O processor
5. Understand the memory hierarchy concepts
6. Describe concept of parallelism and types of hazard

21CS405 Web Coding and Development

1. Understand HTML tags and CSS to design static web pages
2. Describe the basic and advanced concepts of Java Scripts to design dynamic web pages.
3. Develop portable and dynamic web pages.
4. Demonstrate PHP server-side scripting language to develop business logic.
5. Make use of database connectivity to communicate database server from web server.
6. Develop Dynamic Web Pages using Flask.

Semester 5

21CS502 Artificial Intelligence and Machine Learning

1. Illustrate the scope of Artificial Intelligence in the real world
2. Demonstrate various machine learning algorithms and its preliminaries
3. Summarize and learn various supervised learning algorithms
4. Model the concepts of classification and regression
5. Summarize and learn various unsupervised learning algorithms
6. Demonstrate and resolve complex clusters using dimensionality reduction

Semester 6

21CS601 Compiler Design

1. Explain different translators and acquire knowledge of compiler & its Phases.
2. Identify formal grammars for specifying the syntax and Semantics of programming languages.
3. Construct parse table for a given grammar.

4. Examine the intermediate code for a given program.
5. Illustrate the symbol table management and storage organization.
6. Develop code optimization techniques to improve the performance of a program.

Semester 7

19CS015 SOFTWARE PROJECT MANAGEMENT (Elective VI)

1. Explain the concepts and issues of Software Project Management
2. Illustrate various Software Architectures
3. Classify Software Risks and Risk Management Strategies
4. Design effective software development model to meet organizational needs
5. Experiment with appropriate methodologies to develop a project schedule
6. Experiment with appropriate techniques to **assess ongoing project performance**

19CSC22 Web Application Developments Framework

1. Understand the fundamentals of web framework.
2. Classify model, view, and controller layers of a web application.
3. Design a web application using a framework.
4. Know the concept of Java web framework.
5. Understand and analyze how modern-day web applications are different from websites.
6. Learn the technologies of Python web framework.

2.6.1-1-IT

Program Educational Objectives

PEO1: Be a competent software engineer or developer either as an individual or as a team player in IT industry and allied branches providing viable solutions

PEO2: Initiate life-long learning to acquire new technologies and adapt to the changing needs of IT industry through self-study, graduate work, and professional development

PEO3: Exhibit professional excellence, ethics, soft skills, leadership qualities as a responsible citizen with societal interest

Program Outcomes

Engineering graduate will be able to

PO 1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. (Engineering knowledge)

PO 2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. (Problem analysis)

PO 3: 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. (Design/development of solutions)

PO 4: 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. (Conduct investigations of complex problems)

PO 5: 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 .(Modern tool usage)

PO 6: 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. (The engineer and society)

PO 7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. (Environment and sustainability)

PO 8: Apply ethical principles and commit to professional ethics and responsibilities and

norms of the engineering practice. (Ethics)

PO 9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. (Individual and team work)

PO 10: 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. (Communication)

PO 11: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. (Project management and finance)

PO 12: 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. (Life-long learning)

PSO1: Implementation of Scientific Computing applications for secure environment to support contemporary services. (Program Specific)

PSO2: Construct software solutions to deliver quality products for Future Enterprise mobility. (Program Specific)

2.6.1-1-IT

LIST OF Cos

Semester   -   **3rd Sem**

Course Code -   **21IT305**
Course Name -   **Data Communication Systems**

Course Outcomes

1. Summarize fundamental concepts of data communications and various modulation and demodulation techniques.
2. Outline the design, operation and propagation methods of metallic transmission lines and fiber optic cables.
3. Understand the technical concepts of multiplexing and various wireless communication systems.
4. Survey various telephone instruments and the impact of cellular telephone systems.
5. Distinguish between various error detection and correction techniques.
6. Explain the functions and applications of various data link protocols.

Course Code -   **21IT304**
Course Name -   **Data Base Management Systems**

Course Outcomes

1. Understand the fundamental concepts of data base and data model.
2. Explain the use of Relational Algebra and integrity constraints in databases
3. Use SQL's Commands to handle the Database
4. Apply Normalization for schema refinement
5. Make use of the concept of transaction management and recovery system in databases
6. Outline Indexing concepts, different types of data

Course Code -   **21IT308**
Course Name -   **Data Base Management Systems Laboratory**

Course Outcomes

1. Demonstrate ER Modeling concepts to design the Database
2. Apply integrity constraints on a database
3. Make use of DDL, DML, DCL, TCL commands in creation and manipulation of Database
4. Utilize sub queries to make the complex queries more readable
5. Implementation of database queries using PL/SQL
6. Experiment with triggers to maintain the referential integrity of data

Semester   -   4th Sem

Course Code -   21IT403
Course Name -   Operating Systems

Course Outcomes

1. Understand computer resources and operating system management.
2. Analyze various CPU Scheduling Algorithms for Process Management.
3. Examine process synchronization and coordination of operating system.
4. Analyze the Main Memory Management and allocation strategies.
5. Identify the use of Virtual Memory management policies with respect to storage management.
6. Identify the need of File-System Interface and I/O Systems.

Course Code -   21IT407
Course Name -   Operating Systems Laboratory

Course Outcomes

1. Demonstrate the basic commands in UNIX and Linux Environment.
2. Experiment with Shell Scripting in Linux Environment.
3. Implement CPU Scheduling algorithms.
4. Analyze Experiment with Dead Lock detection and avoidance mechanisms.
5. Implement various Page Replacement techniques.
6. Make use of Semaphores for Inter Process Communication

Course Code -   21IT405
Course Name -   WEB Technologies

Course Outcomes

1. Illustrate client-side scripting tools to create and modify web pages.
2. Infer the knowledge of web programming to develop and maintain web pages.
3. Develop portable and dynamic web pages.
4. Demonstrate server-side scripting languages to develop business logic.
5. Make use of database connectivity to communicate database server from web server.
6. Test for client-server web application development in real time internet domains.

Semester   -   5th Sem

Course Code -   21IT502
Course Name -   Artificial Intelligence

Course Outcomes

1. Interprets different types of AI agents.
2. Identify various AI search algorithms (Un-informed, Informed, Heuristic, Constraint Satisfaction, Genetic Algorithms) for e-domain application systems.
3. Compare fundamentals of knowledge representation (Logic-based, Frame-based, Semantic Nets), Inference and Theorem proving.
4. Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
5. Apply knowledge representation, reasoning and machine learning techniques to real-time application Systems.
6. Understand independent (or in a small group) research and communicate it effectively in a seminar setting.

Course Code -   21IT503
Course Name -   Cloud Computing

Course Outcomes

1. Interpret the architecture and infrastructure models of cloud computing, strengths, and limitations of cloud computing.
2. Understand the virtualization concepts of machines and data centers.
3. Infer the design concepts of cloud ready applications
4. Compare different cloud center's implementation
5. Understand the concepts of cloud scaling and disaster recovery
6. Analyze the performance, scalability, and availability of the underlying cloud technologies and software

Course Code -   21IT507
Course Name -   Cloud Computing Laboratory

Course Outcomes

1. Demonstrate the types of cloud computing architecture
2. Create and run virtual machines on open-source OS
3. Working with Mangrasoft Aneka Software
4. Implement and Configuration of Justcloud
5. Implement virtual machine using trystack
6. Study and Use of Microsoft Azure

Semester   -   6th Sem

Course Code -   21IT602
Course Name -   Automata and Compiler Design

Course Outcomes

1. Analyses and design finite automata, pushdown automata for the formal languages and grammars.
2. Apply working skills in theory and application of finite state machines in compiler design.
3. Demonstrate a compiler that includes all the phases of Compiler Design.
4. Show recursive descent-production rules-parsing-and language semantics in high level compilers.
5. Demonstrate the machine dependent and independent codes.
6. Judge the ideas-the techniques-and the knowledge acquired for the purpose of other software design.

Course Code -   21IT603
Course Name -   Machine Learning

Course Outcomes

1. Understand a wide variety of learning algorithms.
2. Understand how to apply a variety of learning algorithms to a set of data using various tools of machine learning.
3. Identify the strengths and weaknesses of many popular machine learning approaches.
4. Analyze the performance of learning algorithms and model selection.
5. Identify mathematical relationships within and across machine learning algorithms and the paradigms of supervised and un-supervised learning.
6. Apply artificial neural networks and deep neural networks in solving complex real-world problems.

Course Code -   21IT606
Course Name -   Machine Learning Lab using Python

Course Outcomes

1. Demonstrate the basics of importing and exporting the dataset in python.
2. Experiment with various libraries in python.
3. Implement supervised learning algorithms.
4. Analyze experimenting with clustering mechanisms.
5. Implement various ensemble methods.
6. Make use of neural network techniques for image classification.

Semester   -   7th Sem

Course Code -   21ITC33
Course Name -   Cloud Security (Cyber Security)

Course Outcomes

1. To understand core concepts of the cloud computing paradigm
2. To learn about characteristics, advantages and challenges brought by the various models and services in cloud computing.
3. To identify the known threats, risks, vulnerabilities and privacy issues associated with Cloud based services.
4. To understand security challenges, threats and risks involved in the cloud application
5. To anlayze the Security Requirements for the Architecture in cloud services
6. To understand Data Security and best practices involved in securing the cloud.

Course Code -   21IT003
Course Name -   Fundamentals of Mobile Computing (OE-3)

Course Outcomes

1. Interpret the GSM architecture and its services.
2. Understand the various wireless applications and study technical feasibility of various mobile applications.
3. Utilize the mobile network layer protocols and its functionalities.
4. Explain any existing or new models of mobile environments for 4G networks
5. Understand platform, protocols and related concepts of Ad hoc and Enterprise wireless networks
6. Understand IP and TCP layers of Mobile Communications

Semester   -   8th Sem

Course Code -   21IT016
Course Name -   Professional Ethics (Elective VIII)

Course Outcomes

1. Understand the importance of ethics in person and IT environment
2. Infer the management of security vulnerabilities and action plan on security incident.
3. Identify the right of privacy and laws of protection for privacy of data.
4. Exemplify the intellectual property and rights.
5. Interpret the concepts of intellectual property and ethical issues of software manufacturers,
6. Summarize the key ethical issues with the use of social networking and impact of IT on living.

Department of CSE-Artificial Intelligence & Data Science

Program Educational Objectives

PEO1:   To produce the competent software engineers as team players in industry and allied fields providing viable solutions.

PEO2:   Adopt contemporary technologies for dynamic industry requirements with self-paced learning providing scope for advanced research.

PEO3:   Nurture professionalism with soft skills, managerial & leadership skills and Ethical values

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PO12: 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. (Life-long learning)

PSO1: Ability to apply the software engineering principles to meet automation of theprocess and service industries apart from the community utilities. (Program Specific)

PSO2: Ability to design, develop and implement management systems, E-Commercetools and WebApps for product development.(Program Specific)

3rd Semester

21MA304 - Probability and Statistics using Python

Course Outcomes:

At the end of the course, students will be able to
1. List the basic data structures of Python and various libraries of Python.
2. Illustrate basic probability axioms and apply Bayes' theorem related to engineering problems.
3. Differentiate between various distributions of random variables on given data.
4. Examine given dataset based on descriptive statistics.
5. Compare the null or alternative hypotheses using the suitable test statistic.
6. Choose appropriate curve fitting and correlation methods for a given data

21CS303 Data Structures

Course Outcomes:

At the end of the course, students will be able to
1. Describe the operations and implementation of List ADT
2. Comprehend the operations and implementation of Stack and Queue
3. Illustrate the applications of linear data structures
4. Describe the operations and implementation of hash table
5. Comprehend the operations and implementation of tree data structure
6. Illustrate the variations of tree data structure

4th Semester

21CS404 Design and Analysis of Algorithms

Course Outcomes:

At the end of the course, students will be able to
1. Understand the fundamentals for analyzing time and space complexity of algorithms
2. Describe the basic principles of various algorithm design techniques
3. Choose and apply appropriate algorithm design technique to solve real time application
4. Analyze the performance of algorithm designed for real time application
5. Understand P and NP problems
6. Analyze the performance of algorithm designed for real time application

21CS405 Foundations of Data Science

Course Outcomes:

At the end of the course, students will be able to
1. Understand the pipeline of machine learning to apply on real world problems
2. Understand the need of Similarity and Dissimilarity between features in data
3. Importance of Pre-processing techniques in real-time
4. Identifying the characteristics of various Regression models in real-world
5. Identifying the characteristics of various supervised learning and ensemble models
6. Identifying the characteristics of various algorithms of unsupervised learning

Department of CSE-Artificial Intelligence & Machine Learning

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