2.6.1: Programme Outcomes (POs) and Course Outcomes (COs) for all Programmes offered by the institution are stated and displayed on website

Sr. No	Department	Page No
1	Department of Civil Engineering	2-24
2	Department of Computer Engineering	25-42
3	Department of Electronics and Telecommunication Engineering	43-61
4	Department of Mechanical Engineering	62-81
5	Department of Electrical Engineering	82-96
6	Department of MCA Engineering	97-106

PRINCIPAL
G.E.S.'s R.H. Sapat Collage of Engg.,
Mgt. Studies & Research
Prin. T.A Kulkarni Vidya Nagar, Nashik-5.

1. Webpage on institute website with statements of Programme Outcomes (POs) and Course Outcomes (COs)

Civil Engineering Department	
Course Outcome Batch 2019-2022	
Course Code	**Course**
FE 2019-2020	
I Semester (FE Sem-I)	
107001 – Engineering Mathematics – I	
CO101.1	Demonstrate the concept of first order first degree differential equations and various techniques to find solution of these differential equations.
CO101.2	Apply the concept of first order first degree differential equation to develop mathematical model of various physical phenomenon like Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc.
CO101.3	Analyze advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions which are applicable in evaluation multiple integrals.
CO101.4	Design the curve for a given equation and measure arc length of various curves.
CO101.5	Illustrate the concepts of solid geometry using equations of sphere, cone and cylinder in a comprehensive manner.
CO101.6	Evaluate multiple integrals and Apply to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.
107002: Engineering Physics	
CO102.1	Classify the types of interference, diffraction and polarization; Analyze the intensity variation of light due to interference, diffraction and polarization and connect it to a few engineering applications.
CO102.2	Describe working principles of laser and explore their applications and explain the basics of optic fibers and compare the types of optic fibers.
CO102.3	Determine numerical aperture, acceptance angle and Fibre losses of optical Fibre and explain the applications of optic fibers.
CO102.4	Explain the concepts and principles in quantum mechanics; Illustrate Schrodinger's equation and apply it to problems on bound states.
CO102.5	Explain the theory of semiconductors, experiment on parameters of Solar cell, Hall effect and Solve problems on related topics.
CO102.6	Classify magnetic materials, explore their applications and explain superconductivity and its application.
CO102.7	Explain methods of destructive testing, non-destructive testing and explore the applications of non-destructive testing.
CO102.8	Describe properties of nano particles and explore its applications.
102003 - Systems in Mechanical Engineering	
CO103.1	Describe and compare the conversion of energy from renewable and non-renewable energy sources

CO103.2	Explain basic laws of thermodynamics, heat transfer and their applications
CO103.3	List down the types of road vehicles and their specifications
CO103.4	Illustrate various basic parts and transmission system of a road vehicle
CO103.5	Discuss several manufacturing processes and identify the suitable process
CO103.6	Explain various types of mechanism and its application
103004: Basic Electrical Engineering
CO104.1	Differentiate between electrical and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.
CO104.2	Calculate series, parallel and composite capacitor as well as characteristics parameters of alternating quantity and phasor arithmetic
CO104.3	Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram
CO104.4	Relate phase and line electrical quantities in polyphase networks, demonstrate the operation of single phase transformer and calculate efficiency and regulation at different loading conditions
CO104.5	Apply and analyze the resistive circuits using star-delta conversion KVL, KCL and different network theorems under DC supply
CO104.6	Evaluate work, power, and energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge.
110005: Programming and Problem Solving
CO105.1	Inculcate and apply various skills in problem solving.
CO105.2	Choose most appropriate programming constructs and features to solve the problems in diversified domains.
CO105.3	Exhibit the programming skills for the problems those require the writing of well-documented programs including use of the logical constructs of language, Python.
CO105.4	Demonstrate significant experience with the Python program development environment
111006 -Workshop Practice
CO106.1	Familiar with safety norms to prevent any mishap in workshop
CO106.2	Able to handle appropriate hand tool, cutting tool and machine tools to manufacture a job.
CO106.3	Able to understand the construction, working and functions of machine tools and their parts.
CO106.4	Able to know simple operations (Turning and Facing) on a center lathe.
101007: Environmental Studies-I (Mandatory Non-Credit Course)
CO107.1	Demonstrate an integrative approach to environmental issues with a focus on sustainability
CO107.2	Explain and identify the role of the organism in energy transfers in different ecosystems
CO107.3	Distinguish between and provide examples of renewable and nonrenewable resources & analyze personal consumption of resources.
CO107.4	Identify key threats to biodiversity and develop appropriate policy options for conserving biodiversity in different settings
II Semester (FE Sem-II)
107008 – Engineering Mathematics – II

CO108.1	the effective mathematical tools for solutions of first order differential equations that model physical processes such as Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc.
CO108.2	Advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions needed in evaluating multiple integrals and their applications.
CO108.3	To trace the curve for a given equation and measure arc length of various curves.
CO108.4	the concepts of solid geometry using equations of sphere, cone and cylinder in a comprehensive manner
CO108.5	Evaluation of multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.
107009: Engineering Chemistry	
CO109.1	To understand technology involved in analysis and improving quality of water as commodity.
CO109.2	To acquire the knowledge of electro-analytical techniques that facilitates rapid and precise understanding of materials
CO109.3	To understand structure, properties and applications of speciality polymers and nano material.
CO109.4	To study conventional and alternative fuels with respect to their properties and applications.
CO109.5	To study spectroscopic techniques for chemical analysis.
CO109.6	To understand corrosion mechanisms and preventive methods for corrosion control.
104010:Basic Electronics Engineering	
CO110.1	Explain the working of P-N junction diode and its circuits.
CO110.2	Identify types of diodes and plot their characteristics and also can compare BJT with MOSFET
CO110.3	Build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops.
CO110.4	Use different electronics measuring instruments to measure various electrical parameters.
CO110.5	Select sensors for specific applications.
101011: Engineering Mechanics	
CO111.1	Determine resultant of various force systems
CO111.2	Determine centroid, moment of inertia and solve problems related to friction
CO111.3	Determine reactions of beams, calculate forces in cables using principles of equilibrium
CO111.4	Solve trusses, frames for finding member forces and apply principles of equilibrium to forces in space
CO111.5	Calculate position, velocity and acceleration of particle using principles of kinematics
CO111.6	Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy
102012: Engineering Graphics	
CO112.1	Draw the fundamental engineering objects using basic rules and able to construct the simple geometries.
CO112.2	Construct the various engineering curves using the drawing instruments.

4

CO112.3	Apply the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object.
CO112.4	Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.
CO112.5	Draw the development of lateral surfaces for cut section of geometrical solids.
CO112.6	Draw fully-dimensioned 2D, 3D drawings using computer aided drafting tools.

110013: Project Based Learning

CO113.1	Project based learning will increase their capacity and learning through shared cognition.
CO113.2	Students able to draw on lessons from several disciplines and apply them in practical way.
CO113.3	Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.

101014: Environmental Studies-II (Mandatory Non-Credit Course)

CO114.1	Have an understanding of environmental pollution and the science behind those problems and potential solutions.
CO114.2	Have knowledge of various acts and laws and will be able to identify the industries that are violating these rules.
CO114.3	Assess the impact of ever increasing human population on the biosphere: social, economic issues and role of humans in conservation of natural resources.
CO114.4	Learn skills required to research and analyze environmental issues scientifically and learn how to use those skills in applied situations such as careers that may involve environmental problems and/or issues.

SE 2020-2021
I Semester (SE Sem-I)
201001 Building Technology and Architectural Planning

CO201.1	Identify types of building and basic requirements of building components.
CO201.2	Make use of Architectural Principles and Building byelaws for building construction.
CO201.3	Plan effectively various types of Residential Building forms according to their utility, functions with reference to National Building Code.
CO201.4	Plan effectively various types of Public Buildings according to their utility functions with reference to National Building Code.
CO201.5	Make use of Principles of Planning in Town Planning, Different Villages and Safety aspects.
CO201.6	Understand different services and safety aspects

201002 Mechanics of Structures

CO202.1	Understand concept of stress-strain and determine different types of stress, strain in determinate, indeterminate homogeneous and composite structures
CO202.2	Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.
CO202.3	Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.

BACK

CO202.4	Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains
CO202.5	Analyze axially loaded and eccentrically loaded column
CO202.6	Determine the slopes and deflection of determinate beams and trusses.
201003 : Fluid Mechanics	
CO203.1	Understand the use of Fluid Properties, concept of Fluid statics, basic equation of Hydrostatics, measurement of fluid pressure, buoyancy & floatation and its application for solving practical problems.
CO203.2	Understand the concept of fluid kinematics with reference to Continuity equation and fluid dynamics with reference to Modified Bernoulli's equation and its application to practical problems of fluid flow
CO203.3	Understand the concept of Dimensional analysis using Buckingham's π theorem, Similarity & Model Laws and boundary layer theory and apply it for solving practical problems of fluid flow.
CO203.4	Understand the concept of laminar and turbulent flow and flow through pipes and its application to determine major and minor losses and analyze pipe network using Hardy Cross method.
CO203.5	Understand the concept of open channel flow, uniform flow and depth-Energy relationships in open channel flow and make the use of Chezy's and Manning's formulae for uniform flow computation and design of most economical channel section
CO203.6	Understand the concept of gradually varied flow in open channel and fluid flow around submerged objects, compute GVF profile and calculate drag and lift force on fully submerged body.
207001 Engineering Mathematics III	
CO204.1	Solve Higher order linear differential equations and its applications to modelling and analyzing Civil engineering problems such as bending of beams, whirling of shafts and mass spring systems.
CO204.2	Solve System of linear equations using direct & iterative numerical techniques and develop solutions for ordinary differential equations using single step & multistep methods applied to hydraulics, geotechnics and structural systems
CO204.3	Apply Statistical methods like correlation, regression and probability theory in data analysis and predictions in civil engineering.
CO204.4	Perform Vector differentiation &integration, analyze the vector fields and apply to fluid flow problems
CO204.5	Solve Partial differential equations such as wave equation, one and two dimensional heat flow equations.
207009 Engineering Geology	

6

CO205.1	Explain about the basic concepts of engineering geology, various rocks, and minerals both in lab and on the fields and their inherent characteristics and their uses in civil engineering constructions
CO205.2	Exploring the importance of mass wasting processes and various tectonic processes that hampers the design of civil engineering projects and its implications on environment and sustainability.
CO205.3	Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.
CO205.4	Incorporate the various methods of survey, to evaluate and interpret geological nature of the rocks present at the foundations of the dams, percolation tanks, tunnels and to infer site / alignment/ level free from geological defects
CO205.5	Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.
CO205.6	Explain geological hazards and importance of ground water and uses of common building stones.
201004 Building Technology and Architectural Planning Lab
CO206.1	Identify types of building and basic requirements of building components.
CO206.2	Make use of Architectural Principles and Building byelaws for building construction.
CO206.3	Plan effectively various types of Residential Building forms according to their utility, functions with reference to National Building Code.
CO206.4	Plan effectively various types of Public Buildings according to their utility functions with reference to National Building Code.
CO206.5	Make use of Principles of Planning in Town Planning, Different Villages and Safety aspects.
CO206.6	Understand different services and safety aspects
201005 Mechanics of Structures Lab
CO207.1	Understand concept of stress-strain and determine different types of stress, strain in determinate, indeterminate homogeneous and composite structures
CO207.2	Calculate shear force and bending moment in determinate beams for different loading conditions and illustrate shear force and bending moment diagram.
CO207.3	Explain the concept of shear and bending stresses in beams and demonstrate shear and bending stress distribution diagram.
CO207.4	Use theory of torsion to determine the stresses in circular shaft and understand concept of Principal stresses and strains
CO207.5	Analyze axially loaded and eccentrically loaded column
CO207.6	Determine the slopes and deflection of determinate beams and trusses.
201006 : Fluid Mechanics Lab

7

CO208.1	Understand the use of Fluid Properties, concept of Fluid statics, basic equation of Hydrostatics, measurement of fluid pressure, buoyancy & floatation and its application for solving practical problems.
CO208.2	Understand the concept of fluid kinematics with reference to Continuity equation and fluid dynamics with reference to Modified Bernoulli's equation and its application to practical problems of fluid flow
CO208.3	Understand the concept of Dimensional analysis using Buckingham's π theorem, Similarity & Model Laws and boundary layer theory and apply it for solving practical problems of fluid flow.
CO208.4	Understand the concept of laminar and turbulent flow and flow through pipes and its application to determine major and minor losses and analyze pipe network using Hardy Cross method.
CO208.5	Understand the concept of open channel flow, uniform flow and depth-Energy relationships in open channel flow and make the use of Chezy's and Manning's formulae for uniform flow computation and design of most economical channel section
CO208.6	Understand the concept of gradually varied flow in open channel and fluid flow around submerged objects, compute GVF profile and calculate drag and lift force on fully submerged body.
207010 Engineering Geology Lab
CO209.1	Explain about the basic concepts of engineering geology, various rocks, and minerals both in lab and on the fields and their inherent characteristics and their uses in civil engineering constructions
CO209.2	Exploring the importance of mass wasting processes and various tectonic processes that hampers the design of civil engineering projects and its implications on environment and sustainability.
CO209.3	Recognize effect of plate tectonics, structural geology and their significance and utility in civil engineering activities.
CO209.4	Incorporate the various methods of survey, to evaluate and interpret geological nature of the rocks present at the foundations of the dams, percolation tanks, tunnels and to infer site / alignment/ level free from geological defects
CO209.5	Assess the Importance of geological nature of the site, precautions and treatments to improve the site conditions for dams, reservoirs, and tunnels.
CO209.6	Explain geological hazards and importance of ground water and uses of common building stones.
201007 Awareness to Civil Engineering Practices Audit Course I
CO210.1	Describe functioning/working of different types of industries/sectors in Civil Engineering.

CO210.2	Describe drawings and documents required and used in different Civil Engineering works.
CO210.3	Understand the importance of Code of Ethics to be practiced by a Civil Engineer and also understand the duties and responsibilities as a Civil Engineer.
CO210.4	Understand different health and safety practices on the site
II Semester (SE Sem-II)
201008 Geotechnical Engineering
CO211.1	Identify and classify the soil based on the index properties and its formation process
CO211.2	Explain permeability and seepage analysis of soil by construction of flow net.
CO211.3	Illustrate the effect of compaction on soil and understand the basics of stress distribution.
CO211.4	Express shear strength of soil and its measurement under various drainage conditions.
CO211.5	Evaluate the earth pressure due to backfill on retaining structures by using different theories.
CO211.6	Analysis of stability of slopes for different types of soils
201009 Surveying
CO212.1	Define and Explain basics of plane surveying and differentiate the instruments used for it.
CO212.2	Express proficiency in handling surveying equipment and analyse the surveying data from these equipment.
CO212.3	Describe different methods of surveying and find relative positions of points on the surface of earth.
CO212.4	Execute curve setting for civil engineering projects such as roads, railways etc.
CO212.5	Articulate advancements in surveying such as space based positioning systems
CO212.6	Differentiate map and aerial photographs, also interpret aerial photographs.
201010 Concrete Technology
CO213.1	Able to select the various ingredients of concrete and its suitable proportion to achieved desired strength.
CO213.2	Able to check the properties of concrete in fresh and hardened state.
CO213.3	Get acquainted to concreting equipment, techniques and different types of special concrete.
CO213.4	Able to predict deteriorations in concrete and get acquainted to various repairing methods and techniques.
201011: Structural Analysis
CO214.1	Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams.
CO214.2	Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames.

9

CO214.3	Implement application of the slope deflection method to beams and portal frames.
CO214.4	Analyze beams and portal frames using moment distribution method.
CO214.5	Determine response of beams and portal frames using structure approach of stiffness matrix method.
CO214.6	Apply the concepts of plastic analysis in the analysis of steel structures

201012 Project Management	
CO215.1	Describe project life cycle and the domains of Project Management
CO215.2	Explain networking methods and their applications in planning and management
CO215.3	Categorize the materials as per their annual usage and also Calculate production rate of construction equipment
CO215.4	Demonstrates resource allocation techniques and apply it for manpower planning.
CO215.5	Understand economical terms and different laws associated with project management
CO215.6	Apply the methods of project selection and recommend the best economical project.

201013 Geotechnical Engineering Lab	
CO216.1	Identify and classify the soil based on the index properties and its formation process
CO216.2	Explain permeability and seepage analysis of soil by construction of flow net.
CO216.3	Illustrate the effect of compaction on soil and understand the basics of stress distribution.
CO216.4	Express shear strength of soil and its measurement under various drainage conditions.
CO216.5	Evaluate the earth pressure due to backfill on retaining structures by using different theories.
CO216.6	Analysis of stability of slopes for different types of soils

201014 Surveying Lab	
CO217.1	Define and Explain basics of plane surveying and differentiate the instruments used for it.
CO217.2	Express proficiency in handling surveying equipment and analyse the surveying data from these equipment.
CO217.3	Describe different methods of surveying and find relative positions of points on the surface of earth.
CO217.4	Execute curve setting for civil engineering projects such as roads, railways etc.
CO217.5	Articulate advancements in surveying such as space based positioning systems
CO217.6	Differentiate map and aerial photographs, also interpret aerial photographs.

201015 Concrete Technology Lab	
CO218.1	Able to select the various ingredients of concrete and its suitable proportion to achieved desired strength.
CO218.2	Able to check the properties of concrete in fresh and hardened state.

CO218.3	Get acquainted to concreting equipment, techniques and different types of special concrete.
CO218.4	Able to predict deteriorations in concrete and get acquainted to various repairing methods and techniques.
201016: Structural Analysis Tutorial	
CO219.1	Understand the basic concept of static and kinematic indeterminacy and analysis of indeterminate beams.
CO219.2	Analyze redundant trusses and able to perform approximate analysis of multi-story multi-bay frames.
CO219.3	Implement application of the slope deflection method to beams and portal frames.
CO219.4	Analyze beams and portal frames using moment distribution method.
CO219.5	Determine response of beams and portal frames using structure approach of stiffness matrix method.
CO219.6	Apply the concepts of plastic analysis in the analysis of steel structures
201017 Project Based Learning	
CO220.1	Identify the community/ practical/ societal needs and convert the idea into a product/ process/ service
CO220.2	Analyse and design the physical/ mathematical/ ICT model in order to solve identified problem/ project.
CO220.3	Create, work in team and applying the solution in practical way to specific problem.
TE 2021-2022	
I Semester (TE Sem-I)	
301001: Hydrology and Water Resource Engineering	
CO301.1	Understand government organizations, apply & analyze precipitation & its abstractions
CO301.2	Understand, apply & analyze runoff, runoff hydrographs and gauging of streams
CO301.3	Understand, apply & analyze floods, hydrologic routing & Q-GIS software in hydrology.
CO301.4	Understand, apply & analyze reservoir planning, capacity of reservoir & reservoir economics
CO301.5	Understand water logging & water management, apply & analyze ground water hydrology
CO301.6	Understand irrigation, piped distribution network and canal revenue, apply and analyze crop water requirement.
301002: Water Supply Engineering	
CO302.1	Define identify, describe reliability of water sources, estimate water requirement for various sectors
CO302.2	Ascertain and interpret water treatment method required to be adopted with respect to source and raw water characteristics

CO302.3	Design various components of water treatment plant and distribution system
CO302.4	Understand and compare contemporary issues and advanced treatment operations and process available in the market, including packaged water treatment plants.
CO302.5	Design elevated service reservoir capacity and understand the rainwater harvesting.
CO302.6	Understand the requirement of water treatment plant for infrastructure and Government scheme.
301003: Design of Steel Structures	
CO303.1	Demonstrate knowledge about the types of steel structures, steel code provisions and design of the adequate steel section subjected to tensile force.
CO303.2	Determine the adequate steel section subjected to compression load and design of built up columns along with lacing and battening.
CO303.3	Design eccentrically loaded column for section strength and column bases for axial load and uniaxial bending.
CO303.4	Design of laterally restrained and unrestrained beam with and without flange plate using rolled steel section
CO303.5	Analyze the industrial truss for dead, live and wind load and design of gantry girder for moving load.
CO303.6	Understand the role of components of welded plate girder and design cross section for welded plate girder including stiffeners and its connections.
301004: Engineering Economics and Financial Management	
CO304.1	Understand basics of construction economics.
CO304.2	Develop an understanding of financial management in civil engineering projects
CO304.3	Prepare and analyze the contract account
CO304.4	Decide on right source of fund for construction projects.
CO304.5	Understand working capital and its estimation for civil engineering projects
CO304.6	Illustrate the importance of tax planning & understand role of financial regulatory bodies
301005 c: Elective I: Construction Management	
CO305.1	Understand the overview of construction sector
CO305.2	Illustrate construction scheduling, work study and work measurement.
CO305.3	Acquaint various labor laws and financial aspects of construction projects.
CO305.4	Explain elements of risk management and value engineering.
CO305.5	State material and human resource management techniques in construction.
CO305.6	Understand basics of artificial intelligence techniques in civil engineering.
301006: Seminar	
CO306.1	Appraise the current civil engineering research / techniques / developments / interdisciplinary areas.

BACK

CO306.2	Review and organize literature survey utilizing technical resources, journals etc.
CO306.3	Evaluate and draw conclusions related to technical content studied.
CO306.4	Demonstrate the ability to perform critical writing by preparing a technical report.
CO306.5	Develop technical writing and presentation skills.
301007: Hydrology and Water Resource Lab	
CO307.1	Understand government organizations, apply & analyze precipitation & its abstractions
CO307.2	Understand, apply & analyze runoff, runoff hydrographs and gauging of streams
CO307.3	Understand, apply & analyze floods, hydrologic routing & Q-GIS software in hydrology.
CO307.4	Understand, apply & analyze reservoir planning, capacity of reservoir & reservoir economics
CO307.5	Understand water logging & water management, apply & analyze ground water hydrology
CO307.6	Understand irrigation, piped distribution network and canal revenue, apply and analyze crop water requirement.
301008: Water Supply Engineering Lab	
CO308.1	Define identify, describe reliability of water sources, estimate water requirement for various sectors
CO308.2	Ascertain and interpret water treatment method required to be adopted with respect to source and raw water characteristics
CO308.3	Design various components of water treatment plant and distribution system
CO308.4	Understand and compare contemporary issues and advanced treatment operations and process available in the market, including packaged water treatment plants.
CO308.5	Design elevated service reservoir capacity and understand the rainwater harvesting.
CO308.6	Understand the requirement of water treatment plant for infrastructure and Government scheme.
301009: Design of Steel Structures Lab	
CO309.1	Demonstrate knowledge about the types of steel structures, steel code provisions and design of the adequate steel section subjected to tensile force.
CO309.2	Determine the adequate steel section subjected to compression load and design of built up columns along with lacing and battening.
CO309.3	Design eccentrically loaded column for section strength and column bases for axial load and uniaxial bending.
CO309.4	Design of laterally restrained and unrestrained beam with and without flange plate using rolled steel section
CO309.5	Analyze the industrial truss for dead, live and wind load and design of gantry girder for moving load.

BACK

13

CO309.6	Understand the role of components of welded plate girder and design cross section for welded plate girder including stiffeners and its connections.
301010 c: Elective I: Construction Management Lab	
CO310.1	Understand the overview of construction sector
CO310.2	Illustrate construction scheduling, work study and work measurement.
CO310.3	Acquaint various labor laws and financial aspects of construction projects.
CO310.4	Explain elements of risk management and value engineering.
CO310.5	State material and human resource management techniques in construction.
CO310.6	Understand basics of artificial intelligence techniques in civil engineering.
301011 a: Audit Course I: Professional Ethics and Etiquettes	
CO311.1	Understand the basic perception of profession, professional ethics, various moral issues and uses of ethical theories
CO311.2	Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
CO311.3	Follow ethics as an engineering professional and adopt good standards and norms of engineering practice.
CO311.4	Apply ethical principles to resolve situations that arise in their professional lives
II Semester (TE Sem-II)	
301012: Waste Water Engineering	
CO312.1	Recall sanitation infrastructure, quantification and characterization of wastewater, natural purification of streams
CO312.2	Design preliminary and primary unit operations in waste water treatment plant
CO312.3	Understand theory and mechanism of aerobic biological treatment system and to design activated sludge process
CO312.4	Understand and design suspended and attached growth wastewater treatment systems economics
CO312.5	Explain and apply concept of contaminant removal by anaerobic, tertiary and emerging wastewater treatment systems
CO312.6	Compare various sludge management systems and explain the potential of recycle and reuse of wastewater treatment
301013: Design of Reinforced Concrete Structures	
CO313.1	Apply relevant IS provisions to ensure safety and serviceability of structures, understand the design philosophies and behavior of materials: steel & concrete. various sectors
CO313.2	Recognize mode of failure as per LSM and evaluate moment of resistance for singly, doubly rectangular, and flanged sections source and raw water characteristics
CO313.3	Design & detailing of rectangular one way and two-way slab with different boundary conditions
CO313.4	Design & detailing of dog legged and open well staircase

14

CO313.5	Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion.
CO313.6	Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending and their footings.

301014: Remote Sensing and Geographic Information System

CO314.1	Articulate fundamentals and principles of RS techniques.
CO314.2	Demonstrate the knowledge of remote sensing and sensor characteristics.
CO314.3	Distinguish working of various spaces-based positioning systems.
CO314.4	Analyze the RS data and image processing to utilize in civil engineering
CO314.5	Explain fundamentals and applications of RS and GIS
CO314.6	Acquire skills of data processing and its applications using GIS

301015 e: Elective II: Architecture and Town Planning

CO315.1	Apply the principles of architectural planning and landscaping for improving quality of life
CO315.2	Understand the confronting issues of the area and apply the acts.
CO315.3	Evaluate and defend the proposals
CO315.4	Appraise the existing condition and to develop the area for betterment.
CO315.5	Understand and demonstrate planning strategy with reference to different acts, guidelines, norms.
CO315.6	appraise multifaceted zones like SEZ, CRZ and Special township, understand applications of modern Tools like GIS / GPS / RS in town planning and need of Rural Planning

301016: Internship

CO316.1	To develop professional competence through industry internship
CO316.2	To apply academic knowledge in a personal and professional environment
CO316.3	To build the professional network and expose students to future employees
CO316.4	Apply professional and societal ethics in their day to day life
CO316.5	To become a responsible professional having social, economic and administrative considerations
CO316.6	To make own career goals and personal aspirations

301017: Waste Water Engineering Lab

CO317.1	Recall sanitation infrastructure, quantification and characterization of wastewater, natural purification of streams
CO317.2	Design preliminary and primary unit operations in waste water treatment plant
CO317.3	Understand theory and mechanism of aerobic biological treatment system and to design activated sludge process
CO317.4	Understand and design suspended and attached growth wastewater treatment systems economics

CO317.5	Explain and apply concept of contaminant removal by anaerobic, tertiary and emerging wastewater treatment systems
CO317.6	Compare various sludge management systems and explain the potential of recycle and reuse of wastewater treatment
301018: Design of Reinforced Concrete Structures Lab	
CO318.1	Apply relevant IS provisions to ensure safety and serviceability of structures, understand the design philosophies and behavior of materials: steel & concrete. various sectors
CO318.2	Recognize mode of failure as per LSM and evaluate moment of resistance for singly, doubly rectangular, and flanged sections source and raw water characteristics
CO318.3	Design & detailing of rectangular one way and two-way slab with different boundary conditions
CO318.4	Design & detailing of dog legged and open well staircase
CO318.5	Design & detailing of singly/doubly rectangular/flanged beams for flexure, shear, bond and torsion.
CO318.6	Design & detailing of short columns subjected to axial load, uni-axial/bi-axial bending and their footings.
301019: Remote Sensing and Geographic Information System Lab	
CO319.1	Articulate fundamentals and principles of RS techniques.
CO319.2	Demonstrate the knowledge of remote sensing and sensor characteristics.
CO319.3	Distinguish working of various spaces-based positioning systems.
CO319.4	Analyze the RS data and image processing to utilize in civil engineering
CO319.5	Explain fundamentals and applications of RS and GIS
CO319.6	Acquire skills of data processing and its applications using GIS
301020 e: Elective II: Architecture and Town Planning Lab	
CO320.1	Apply the principles of architectural planning and landscaping for improving quality of life
CO320.2	Understand the confronting issues of the area and apply the acts.
CO320.3	Evaluate and defend the proposals
CO320.4	Appraise the existing condition and to develop the area for betterment.
CO320.5	Understand and demonstrate planning strategy with reference to different acts, guidelines, norms.
CO320.6	appraise multifaceted zones like SEZ, CRZ and Special township, understand applications of modern Tools like GIS / GPS / RS in town planning and need of Rural Planning
301021 a: Audit Course II: Leadership and Personality Development	
CO321.1	Enhanced holistic development of students and improve their employability skills
BE 2022-2023	

BACK

16

I Semester (BE Sem-I)	
401001: Foundation Engineering	
CO401.1	Perform subsurface investigations for foundations using different methods.
CO401.2	Estimate the bearing capacity of shallow foundations.
CO401.3	Calculate immediate and primary consolidation settlement of shallow foundations.
CO401.4	Decide the capacity of a pile and pile group.
CO401.5	Understand the steps in geotechnical design of shallow foundations and well foundations.
CO401.6	Analyze problems related to expansive soil and overcome them using design principles, construction techniques in black cotton soil.
401002: Transportation Engineering	
CO402.1	Understand principles and practices of transportation planning.
CO402.2	Demonstrate knowledge of traffic studies, analysis and their interpretation.
CO402.3	Design Geometric Elements of road pavement.
CO402.4	Evaluate properties of highway materials as a part of road pavement.
CO402.5	Appraise different types of pavements and their design.
CO402.6	Understand the fundamentals of Bridge Engineering and Railway Engineering
401 003 B Elective III: Advanced Design of Concrete Structures	
CO403B.1	Understand yield line theory and apply it to analyze and design slabs of different shapes having different edge conditions.
CO403B.2	Understand the concepts of ductile detailing
CO403B.3	Analyze and design of flat slab.
CO403B.4	Analyze and design of retaining walls.
CO403B.5	Analyze and design of liquid retaining structures.
CO403B.6	Analyze and design of RC frames and shear walls.
401 003 C Elective III: Integrated Water Resources Planning and Management	
CO403C.1	Understand concerned organizations, IWRP & M objectives, principles, challenges, application & analysis of IWRP&M approaches & principles in a case study.
CO403C.2	Understand PIM, WDS, WALMI, agriculture in the concept of integrated water resources, apply and analyse water requirements for food production
CO403C.3	Understand assessment of surface and ground water quality, EIA, CPCB regulations, application & analysis of effluent quality standards as per CPCB
CO403C.4	Understand water economics and funding, application & analysis of planning for a sustainable water future
CO403C.5	Understand legal regulatory settings of IWRP & M, application & analysis of inter-basin water transfers and IWRP & M
CO403C.6	Understand flood control & power generation for IWRP & M, application QIGIS for analysis of a basin for IWRP & M
401 004 a Elective IV: Air Pollution and Control	

17

CO404.1	Recall air pollution, legislation and regulations.
CO404.2	Evaluate air pollutant concentrations as a function of meteorology.
CO404.3	Interpret sampling results with prescribed standards.
CO404.4	Assess emission inventory and air quality models.
CO404.5	Compare the air pollution control equipment.
CO404.6	Infer indoor air pollution and its mitigation.

401 005: Project Stage I

CO405.1	Appraise the current Civil Engineering research/ techniques/ developments/ interdisciplinary areas.
CO405.2	Review and organize literature survey utilizing technical resources, journals etc.
CO405.3	Evaluate and draw conclusions related to technical content studied.
CO405.4	Demonstrate the ability to perform critical writing by preparing a technical report.
CO405.5	Develop technical writing and presentation skills.

401006: Transportation Engineering Lab

CO406.1	Understand principles and practices of transportation planning.
CO402.2	Demonstrate knowledge of traffic studies, analysis and their interpretation.
CO402.3	Design Geometric Elements of road pavement.
CO402.4	Evaluate properties of highway materials as a part of road pavement.
CO402.5	Appraise different types of pavements and their design.
CO402.6	Understand the fundamentals of Bridge Engineering and Railway Engineering

401 007 B Elective III: Advanced Design of Concrete Structures Lab

CO407B.1	Understand yield line theory and apply it to analyze and design slabs of different shapes having different edge conditions.
CO407B.2	Understand the concepts of ductile detailing
CO407B.3	Analyze and design of flat slab.
CO407B.4	Analyze and design of retaining walls.
CO407B.5	Analyze and design of liquid retaining structures.
CO407B.6	Analyze and design of RC frames and shear walls.

401 007 C Elective III: Integrated Water Resources Planning and Management Lab

CO407C.1	Understand concerned organizations, IWRP & M objectives, principles, challenges, application & analysis of IWRP&M approaches & principles in a case study.
CO407C.2	Understand PIM, WDS, WALMI, agriculture in the concept of integrated water resources, apply and analyse water requirements for food production
CO407C.3	Understand assessment of surface and ground water quality, EIA, CPCB regulations, application & analysis of effluent quality standards as per CPCB
CO407C.4	Understand water economics and funding, application & analysis of planning for a sustainable water future

18

CO407C.5	Understand legal regulatory settings of IWRP & M, application & analysis of inter-basin water transfers and IWRP & M
CO407C.6	Understand flood control & power generation for IWRP & M, application QIGIS for analysis of a basin for IWRP & M
401 008 a Elective IV: Air Pollution and Control Lab	
CO408a.1	Recall air pollution, legislation and regulations.
CO408a.2	Evaluate air pollutant concentrations as a function of meteorology.
CO408a.3	Interpret sampling results with prescribed standards.
CO408a.4	Assess emission inventory and air quality models.
CO408a.5	Compare the air pollution control equipment.
CO408a.6	Infer indoor air pollution and its mitigation.
401 009: Computer Programming in Civil Engineering	
CO409.1	Understand basics of Python Programming
CO409.2	Write Python codes for variety of problems in civil Engineering
401010 Audit Course I a: Stress Management by Yoga	
CO410.1	Develop understanding of Yoga and its impact on human body and mind.
CO410.2	Learn different Yogasans
CO410.3	Develop an understanding of meditation through pranayama
CO410.4	Learn different techniques of Pranayam
II Semester (BE Sem-II)	
401011: Dams and Hydraulics Structures	
CO411.1	Understand types of dams and instrumentation working
CO411.2	Execute stability analysis of Gravity Dam
CO411.3	Understand types of spillways & Design of Ogee spillway
CO411.4	Illustrate the failures and analyze stability of earthen dam
CO411.5	Design Canals and understand the canal structures
CO411.6	Analysis of the Diversion headwork and Cross Drainage work
401012: Quantity Surveying, Contracts and Tenders	
CO412.1	Understand concept of estimates and prepare approximate estimate for various for Civil Engineering works.
CO412.2	Describe tendering process, construction contracts, and aspects of Arbitration and prepare tender documents.
CO412.3	Prepare detailed estimate of various items of work by different methods and calculate quantity of steel from Bar bending schedule.
CO412.4	Apply engineering knowledge to prepare estimate for roads, culverts, and water tank (Elevated storage tank)
CO412.5	Apply concepts of specification to draft brief specification, detailed specification and prepare detailed rate analysis report.

BACK

19

CO412.6	Evaluate depreciation and valuation of property on the basis of present condition, specifications and market trend.
401013 e Elective V: Hydropower Engineering
CO413e.1	Understand the classification of power resources & trends in energy use patterns.
CO413e.2	Identify the components of hydro power plant.
CO413e.3	Analyze the load assessment for turbines.
CO413e.4	Prepare the layout of power house based on the various structures need for it.
CO413e.5	Design the turbines and surge tanks.
CO413e.6	Understand the laws and regulatory aspects of hydroelectric power.
4010 14 c Elective VI: Geo-Synthetic Engineering
CO414 c.1	Explain types of Geo-synthetic material and its application in construction industry
CO414 c.2	Define physical and engineering properties of geo-synthetics material
CO414 c.3	Describe function of geo-synthetics material and its application in geo environment engineering
CO414 c.4	Analyse effect of geo-synthetics in design of flexible pavements
CO414 c.5	Design the reinforced soil retaining structures
CO414 c.6	Explain mechanism of soil reinforcement to improve bearing capacity of soil
401 015: Project Stage II
CO415.1	Appraise the current Civil Engineering research/ techniques/ developments/ interdisciplinary areas.
CO415.2	Review and organize literature survey utilizing technical resources, journals etc.
CO415.3	Evaluate and draw conclusions related to technical content studied.
CO415.4	Demonstrate the ability to perform critical writing by preparing a technical report.
CO415.5	Develop technical writing and presentation skills.
401016: Dams and Hydraulics Structures Lab
CO416.1	Understand types of dams and instrumentation working
CO416.2	Execute stability analysis of Gravity Dam
CO416.3	Understand types of spillways & Design of Ogee spillway
CO416.4	Illustrate the failures and analyze stability of earthen dam
CO416.5	Design Canals and understand the canal structures
CO416.6	Analysis of the Diversion headwork and Cross Drainage work
401017: Quantity Surveying, Contracts and Tenders Lab
CO417.1	Understand concept of estimates and prepare approximate estimate for various for Civil Engineering works.
CO417.2	Describe tendering process, construction contracts, and aspects of Arbitration and prepare tender documents.
CO417.3	Prepare detailed estimate of various items of work by different methods and calculate quantity of steel from Bar bending schedule.

BACK

20

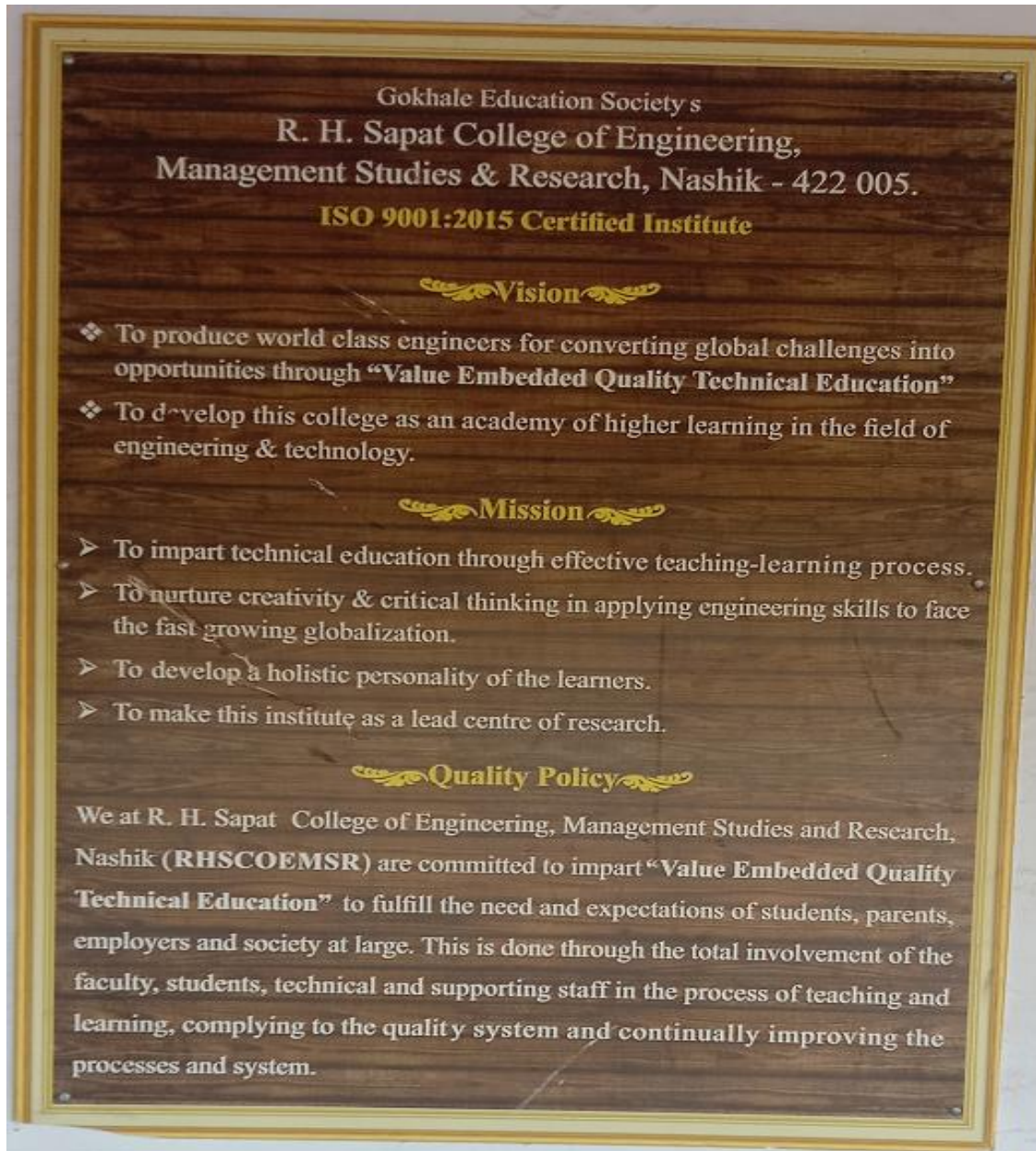|	
CO417.4	Apply engineering knowledge to prepare estimate for roads, culverts, and water tank (Elevated storage tank)
CO417.5	Apply concepts of specification to draft brief specification, detailed specification and prepare detailed rate analysis report.
CO417.6	Evaluate depreciation and valuation of property on the basis of present condition, specifications and market trend.
401018e Elective V: Hydropower Engineering Lab
CO418 e.1	Understand the classification of power resources & trends in energy use patterns.
CO418 e.2	Identify the components of hydro power plant.
CO418 e.3	Analyze the load assessment for turbines.
CO418 e.4	Prepare the layout of power house based on the various structures need for it.
CO418 e.5	Design the turbines and surge tanks.
CO418 e.6	Understand the laws and regulatory aspects of hydroelectric power.
401019 Audit Course II a: Social Responsibility
CO419.1	Develop understanding of social responsibility
CO419.2	Learn the International framework for Social Responsibility
CO419.3	Know the drivers of social responsibility in India
CO419.4	Identify the key stakeholders of social responsibility

PRINCIPAL
G.E.S.'s R.H. Sapat Collage of Engg.,
Mgt. Studies & Research
Prin. T.A Kulkarni Vidya Nagar, Nashik-5.

BACK

21

2. Display boards outside department for communicating vision, mission, POs, PEOs, PSOs.

Department of Civil Engineering

Gokhale Education Society's
R H Sapat College of Engineering, Management Studies And Research, Nashik

DEPARTMENT OF Civil ENGINEERING

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

PO2 Problem Analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematic s, natural sciences, and engineering sciences.

PO3 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.

PO4 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.

PO5 Modern Tool usage : Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling   to complex engineering activities with an understanding of the limitations.

PO6 The Engineer and Society : Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibiliti es relevant to the professional engineering practice.

PO7 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.

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

PO9 Individual and Team Work : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 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.

PO11 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 multidisciplinary environments.

PO12 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.

23

Gokhale Education Society's
R H Sapat College of Engineering, Management Studies And Research, Nashik

Department of Civil Engineering

Vision
- To produce globally acceptable civil engineers through value embedded technical education

Mission
- To impart fundamental knowledge through creative teaching learning process
- To nurture soft skills in students to make them competitive
- To impart onsite training and hands on experience to use latest software's
- To improve living conditions of the society

Program Specific Outcomes (PSOs)

Graduates in Civil Engineering will be able to

1. Function as competent civil engineer for the safety and betterment of the society
2. Function as design consultants for the design of civil engineering projects
3. Execute civil engineering projects & provide sustainable solutions to the civil engineering problems.

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Mgt. Studies & Research
Prin. T.A. Kulkarni Vidya Nagar, Nashik-5.

Course Outcome Batch 2019-23 COMPUTER DEPARTMENT	
Course Code	**Course**
SEMESTER I	
FE 2019-20	
107001	**Engineering Mathematics-I**
CO1	Mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems.
CO2	The Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.
CO3	To deal with derivative of functions of several variables that are essential in various branches of Engineering.
CO4	To apply the concept of Jacobian to find partial derivative of implicit function and functional dependence. Use of partial derivatives in estimating error and approximation and finding extreme values of the function.
CO5	The essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, finding linear and orthogonal transformations, Eigen values and Eigen vectors applicable to engineering problems
107002	**Engineering Physics**
CO1	Develop understanding of interference, diffraction and polarization; connect it to few engineering applications.
CO2	Learn basics of lasers and optical fibers and their use in some applications.
CO3	Understand concepts and principles in quantum mechanics. Relate them to some applications.
CO4	Understand theory of semiconductors and their applications in some semiconductor devices.
CO5	Summarize basics of magnetism and superconductivity. Explore few of their technological applications.
CO6	Comprehend use of concepts of physics for Non Destructive Testing. Learn some properties of nano materials and their application.
102003	**Systems in Mechanical Engineering**
CO1	Describe and compare the conversion of energy from renewable and non-renewable energy sources
CO2	Explain basic laws of thermodynamics, heat transfer and their applications
CO3	List down the types of road vehicles and their specifications
CO4	Illustrate various basic parts and transmission system of a road vehicle
CO5	Discuss several manufacturing processes and identify the suitable process
CO6	Explain various types of mechanism and its application
103004	**Basic Computer Engineering**
CO1	Differentiate between Computer and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.
CO2	Calculate series, parallel and composite capacitor as well as characteristics parameters of alternating quantity and phasor arithmetic
CO3	Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram.

Back

25

CO4	Relate phase and line Computer quantities in poly phase networks, demonstrate the operation of single phase transformer and calculate efficiency and regulation at different loading conditions
CO5	Apply and analyze the resistive circuits using star-delta conversion KVL, KCL and different network theorems under DC supply
CO6	Evaluate work, power, and energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge.
110005	**Programming and Problem Solving**
CO1	Inculcate and apply various skills in problem solving
CO2	Choose most appropriate programming constructs and features to solve the problems in diversified domains
CO3	Exhibit the programming skills for the problems those require the writing of well documented programs including use of the logical constructs of language, Python.
CO4	Demonstrate significant experience with the Python program development environment.
111006	**Workshop Practice**
CO1	Familiar with safety norms to prevent any mishap in workshop.
CO2	Able to handle appropriate hand tool, cutting tool and machine tools to manufacture a job.
CO3	Able to understand the construction, working and functions of machine tools and their parts.
CO4	Able to know simple operations (Turning and Facing) on a centre lathe.
101007	**Environmental Studies-I**
CO1	Demonstrate an integrative approach to environmental issues with a focus on sustainability.
CO2	Explain and identify the role of the organism in energy transfers in different ecosystems.
CO3	Distinguish between and provide examples of renewable and nonrenewable resources & analyze personal consumption of resources.
CO4	Identify key threats to biodiversity and develop appropriate policy options for conserving biodiversity in different settings.
SEMESTER II	
FE 2019-20	
107008	**Engineering Mathematics – II**
CO1	The effective mathematical tools for solutions of first order differential equations that model physical processes such as Newton's law of cooling, Computer circuit, rectilinear motion, mass spring systems, heat transfer etc
CO2	Advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions needed in evaluating multiple integrals and their applications.
CO3	To trace the curve for a given equation and measure arc length of various curves.
CO4	The concepts of solid geometry using equations of sphere, cone and cylinder in a comprehensive manner.
CO5	Evaluation of multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.
107009	**Engineering Chemistry**
CO1	Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity.

CO2	Select appropriate electro-technique and method of material analysis.
CO3	Demonstrate the knowledge of advanced engineering materials for various engineering applications.
CO4	Analyze fuel and suggest use of alternative fuels.
CO5	Identify chemical compounds based on their structure.
CO6	Explain causes of corrosion and methods for minimizing corrosion.
104010	**Basic Electronics Engineering**
CO1	Explain the working of P-N junction diode and its circuits.
CO2	Identify types of diodes and plot their characteristics and also can compare BJT with MOSFET.
CO3	Build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops
CO4	Use different electronics measuring instruments to measure various Computer parameters.
CO5	Select sensors for specific applications.
101011	**Engineering Mechanics**
CO1	Determine resultant of various force systems
CO2	Determine centroid, moment of inertia and solve problems related to friction
CO3	Determine reactions of beams, calculate forces in cables using principles of equilibrium
CO4	Solve trusses, frames for finding member forces and apply principles of equilibrium to forces in space
CO5	Calculate position, velocity and acceleration of particle using principles of kinematics
CO6	Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy
102012	**Engineering Graphics**
CO1	Draw the fundamental engineering objects using basic rules and able to construct the simple geometries.
CO2	Construct the various engineering curves using the drawing instruments.
CO3	Apply the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object.
CO4	Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.
CO5	Draw the development of lateral surfaces for cut section of geometrical solids.
CO6	Draw fully-dimensioned 2D, 3D drawings using computer aided drafting tools.
110013	**Project Based Learning**
CO1	Project based learning will increase their capacity and learning through shared cognition.
CO2	Students able to draw on lessons from several disciplines and apply them in practical way.
CO3	Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students' attitudes towards learning.
101014	**Environmental Studies-II**
CO1	Have an understanding of environmental pollution and the science behind those problems and potential solutions.

Back

27

CO2	Have knowledge of various acts and laws and will be able to identify the industries that are violating these rules.
CO3	Assess the impact of ever increasing human population on the biosphere: social, economic issues and role of humans in conservation of natural resources.
CO4	Learn skills required to research and analyze environmental issues scientifically and learn how to use those skills in applied situations such as careers that may involve environmental problems and/or issues
SEMESTER III	
SE 2020-21	
207006	**Engineering Mathematics-III**
CO1	Solve higher order linear differential equation using appropriate techniques to model and analyze Computer circuits.
CO2	Apply Integral transforms such as Laplace transform and special functions to solve problems related to Computer engineering applications.
CO3	Apply Integral transforms such as Fourier transform and Z-Transform to solve problems related to signal processing and control systems.
CO4	Apply Statistical methods like correlation, regression and Probability theory as applicable to analyze and interpret experimental data related to energy management, power systems, testing and quality control.
CO5	Perform Vector differentiation and integration, analyze the vector fields and apply to wave theory and electro-magnetic fields.
CO6	Analyze Complex functions, conformal mappings, and perform contour integration in the study of electrostatics, signal and image processing.
210241	**Discrete Mathematics**
CO1	Formulate problems precisely, solve the problems, apply formal proof techniques, and explain the reasoning clearly
CO2	Apply appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts.
CO3	Design and analyze real world engineering problems by applying set theory, propositional logic and to construct proofs using mathematical induction.
CO4	Specify, manipulate and apply equivalence relations; construct and use functions and apply these concepts to solve new problems.
CO5	Calculate numbers of possible outcomes using permutations and combinations; to model and analyze computational processes using combinatorics.
CO6	Model and solve computing problem using tree and graph and solve problems using appropriate algorithms.
CO7	Analyze the properties of binary operations, apply abstract algebra in coding theory and evaluate the algebraic structures.
210242	**Fundamentals of Data Structures**
CO1	Design the algorithms to solve the programming problems, identify appropriate algorithmic trategy for specific application, and analyze the time and space complexity.
CO2	Discriminate the usage of various structures, Design/Program/Implement the appropriate data structures; use them in implementations of abstract data types and Identity the appropriate data structure in approaching the problem solution.
CO3	Demonstrate use of sequential data structures- Array and Linked lists to store and process data.

28

CO4	Understand the computational efficiency of the principal algorithms for searching and sorting and choose the most efficient one for the application.
CO5	Compare and contrast different implementations of data structures (dynamic and static).
CO6	Understand, Implement and apply principles of data structures-stack and queue to solve computational problems.
210243	**Object Oriented Programming(OOP)**
CO1	Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
CO2	Design object-oriented solutions for small systems involving multiple objects.
CO3	Use virtual and pure virtual function and complex programming situations.
CO4	Apply object-oriented software principles in problem solving.
CO5	Analyze the strengths of object-oriented programming.
CO6	Develop the application using object oriented programming language(C++).
210244	**Computer Graphics**
CO1	Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
CO2	Apply mathematics to develop Computer programs for elementary graphic operations.
CO3	Illustrate the concepts of windowing and clipping and apply various algorithms to fill and clip polygons.
CO4	Understand and apply the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection.
CO5	Understand the concepts of color models, lighting, shading models and hidden surface elimination.
CO6	Create effective programs using concepts of curves, fractals, animation and gaming.
210245	**Digital Electronics and Logic Design**
CO1	Simplify Boolean Expressions using K Map
CO2	Design and implement combinational circuits
CO3	Design and implement sequential circuits
CO4	Develop simple real-world application using ASM and PLD
CO5	Choose appropriate logic families IC packages as per the given design specifications
CO6	Explain organization and architecture of computer system
210246	**Data Structures Laboratory**
CO1	Use algorithms on various linear data structure using sequential organization to solve real life problems.
CO2	Analyze problems to apply suitable searching and sorting algorithm to various applications.
CO3	Analyze problems to use variants of linked list and solve various real life problems.
CO4	Designing and implement data structures and algorithms for solving different kinds of problems .
210247	**OOP and Computer Graphics Laboratory**
CO1	Understand and apply the concepts like inheritance, polymorphism, exception handling and generic structures for implementing reusable programming codes.

Back

29

CO2	Analyze the concept of file and apply it while storing and retrieving the data from secondary storages.
CO3	Analyze and apply computer graphics algorithms for line-circle drawing, scan conversion and filling with the help of object oriented programming concepts
CO4	Understand the concept of windowing and clipping and apply various algorithms to fill and clip polygons.
CO5	Apply logic to implement, curves, fractals, animation and gaming programs.
CO6	Implement all concepts of OOP and CG
210248	**Digital Electronics Laboratory**
CO1	Understand the working of digital electronic circuits.
CO2	Apply the knowledge to appropriate IC as per the design specifications.
CO3	Design and implement Sequential and Combinational digital circuits as per the specifications.
210249	**Business Communication Skills**
CO1	Express effectively through verbal/oral communication and improve listening skills
CO2	Write precise briefs or reports and technical documents.
CO3	Prepare for group discussion / meetings / interviews and presentations.
CO4	Explore goal/target setting, self-motivation and practicing creative thinking.
CO5	Operate effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership qualities.
210250	**Humanity and Social Science**
CO1	Aware of the various issues concerning humans and society.
CO2	Aware about their responsibilities towards society.
CO3	Sensitized about broader issues regarding the social, cultural, economic and human aspects, involved in social changes.
CO4	Able to understand the nature of the individual and the relationship between self and the Community.
CO5	Able to understand major ideas, values, beliefs, and experiences that have shaped human history and cultures.
210251	**Audit Course 3-II: Social Awareness and Governance Program**
CO1	Understand social issues and responsibilities as member of society.
CO2	Apply social values and ethics in decision making at social or organizational level
CO3	Promote obstacles in national integration and role of youth for National Integration
CO4	Demonstrate basic features of Indian Constitution.
SEMESTER IV	
SE 2020-21	
207003	**Engineering Mathematics III**
CO1	Solve Linear differential equations, essential in modelling and design of computer-based systems.
CO2	Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.
CO3	Apply Statistical methods like correlation and regression analysis and probability theory for data analysis and predictions in machine learning.
CO4	Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques.

Back

CO5	Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.
210252	**Data Structures and Algorithms**
CO1	Identify and articulate the complexity goals and benefits of a good hashing scheme for real- world applications
CO2	Apply non-linear data structures for solving problems of various domain.
CO3	Design and specify the operations of a nonlinear-based abstract data type and implement them in a high-level programming language
CO4	Analyze the algorithmic solutions for resource requirements and optimization
CO5	Use efficient indexing methods and multiway search techniques to store and maintain data.
CO6	Use appropriate modern tools to understand and analyze the functionalities confined to the secondary storage.
210253	**Software Engineering**
CO1	Analyze software requirements and formulate design solution for a software.
CO2	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
CO3	Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.
CO4	Model and design User interface and component-level.
CO5	Identify and handle risk management and software configuration management.
CO6	Utilize knowledge of software testing approaches, approaches to verification and validation.
CO7	Analyze software requirements and formulate design solution for a software.
210254	**Microprocessor**
CO1	Exhibit skill of assembly language programming for the application.
CO2	Classify Processor architectures.
CO3	Illustrate advanced features of 80386 Microprocessor.
CO4	Compare and contrast different processor modes.
CO5	Use interrupts mechanism in applications
CO6	Differentiate between Microprocessors and Microcontrollers & Identify and analyze the tools and techniques used to design, implement, and debug microprocessor-based ystems.
210255	**Principles of Programming Languages**
CO1	Make use of basic principles of programming languages.
CO2	Develop a program with Data representation and Computations.
CO3	Develop programs using Object Oriented Programming language : Java.
CO4	Develop application using inheritance, encapsulation, and polymorphism
CO5	Demonstrate Multithreading for robust application development.
CO6	Develop a simple program using basic concepts of Functional and Logical programming paradigm.
210256	**Data Structures and Algorithms Laboratory**
CO1	Understand the ADT/libraries, hash tables and dictionary to design algorithms for a specific problem

CO2	Choose the most appropriate data structures and apply algorithms for graphical solutions of the problems.
CO3	Apply and analyze non linear data structures to solve real world complex problems
CO4	Apply and analyze algorithm design techniques for indexing, sorting, multi-way searching, file organization and compression
CO5	Analyze the efficiency of most appropriate data structure for creating efficient solutions for engineering design situations
210257	**Microprocessor Laboratory**
CO1	Understand and apply various addressing modes and instruction set to implement assembly language programs.
CO2	Apply logic to implement code conversion
CO3	Analyze and apply logic to demonstrate processor mode of operation.
210258	**Project Based Learning II**
CO1	Identify the real life problem from societal need point of view
CO2	Choose and compare alternative approaches to select most feasible one
CO3	Analyze and synthesize the identified problem from technological perspective
CO4	Design the reliable and scalable solution to meet challenges
CO5	Evaluate the solution based on the criteria specified
CO6	Inculcate long life learning attitude towards the societal problems
210259	**Code of Conduct**
CO1	Understand the basic perception of profession, professional ethics, various moral and social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
CO2	Aware of professional rights and responsibilities of an engineer, responsibilities of an engineer for safety and risk benefit analysis.
CO3	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
CO4	Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.
	AC4-III: The Science of Happiness
CO1	Understand what happiness is and why it matters to you
CO2	Learn how to increase your own happiness
CO3	Understand of the power of social connections and the science of empathy
CO4	Understand what is mindfulness and its real world applications
SEMESTER V	
TE 2021-22	
310241	**Database Management Systems**
CO1	Analyze and design Database Management System using ER model
CO2	Implement database queries using database languages
CO3	Normalize the database design using normal forms
CO4	Apply Transaction Management concepts in real-time situations
CO5	Use NoSQL databases for processing unstructured data
CO6	Differentiate between Complex Data Types and analyze the use of appropriate data types

Back

310242	**Theory of Computation**
CO1	Understand formal language, translation logic, essentials of translation, alphabets, language representation and apply it to design Finite Automata and its variants
CO2	Construct regular expression to present regular language and understand pumping lemma for RE
CO3	Design Context Free Grammars and learn to simplify the grammar
CO4	Construct Pushdown Automaton model for the Context Free Language
CO5	Design Turing Machine for the different requirements outlined by theoretical computer science
CO6	Understand different classes of problems, classify and analyze them and study concepts of NP completeness
310243	**Systems Programming and Operating System**
CO1	To get acquainted with the basics of System Programming
CO2	To acquire knowledge of data structures used in the design of System Software
CO3	To be familiar with the format of object modules, the functions of linking, relocation, and loading
CO4	To comprehend the structures and functions of Operating Systems and process management.
CO5	To deal with concurrency and deadlock in the Operating System
CO6	To learn and understand memory management of Operating System
310244	**Computer Networks and Security**
CO1	Analyze needs and challenges for Data Science Big Data Analytics
CO2	Apply statistics for Big Data Analytics
CO3	Apply the lifecycle of Big Data analytics to real world problems
CO4	Implement Big Data Analytics using Python programming
CO5	Implement data visualization using visualization tools in Python programming
CO6	Design and implement Big Databases using the Hadoop ecosystem
310245(D)	**Software Project Management**
CO1	Comprehend Project Management Concepts
CO2	Use various tools of Software Project Management
CO3	Schedule various activities in software projects
CO4	Track a project and manage changes
CO5	Apply Agile Project Management
CO6	Analyse staffing process for team building and decision making in Software Projects and Management Cour
310246	**Database Management Systems Laboratory**
CO1	Design E-R Model for given requirements and convert the same into database tables
CO2	Design schema in appropriate normal form considering actual requirements
CO3	Implement SQL queries for given requirements , using different SQL concepts
CO4	Implement PL/SQL Code block for given requirements
CO5	Implement NoSQL queries using MongoDB
CO6	Design and develop application considering actual requirements and using database concepts
310247	**Computer Networks and Security Laboratory**
CO1	Analyze the requirements of network types, topology and transmission media
CO2	Demonstrate error control, flow control techniques and protocols and analyze them

33

CO3	Demonstrate the subnet formation with IP allocation mechanism and apply various routing Algorithms
CO4	Develop Client-Server architectures and prototypes
CO5	Implement web applications and services using application layer protocols
CO6	Use network security services and mechanisms
310248	**Laboratory Practice I**
CO1	Implement language translators
CO2	Use tools like LEX and YACC
CO3	Implement internals and functionalities of Operating System
CO4	Apply Software Project Management tools
CO5	Implement software project planning and scheduling
CO6	Analyse staffing in software project
310249	**Seminar and Technical Communication**
CO1	Analyze a latest topic of professional interest
CO2	Enhance technical writing skills
CO3	Identify an engineering problem, analyze it and propose a work plan to solve it
CO4	Communicate with professional technical presentation skills
	Professional Ethics and Etiquettes
CO1	Summarize the principles of proper courtesy as they are practiced in the workplace
CO2	Apply proper courtesy in different professional situations
CO3	Practice and apply appropriate etiquettes in the working environment and day to day life
CO4	Build proper practices personal and business communications of Ethics and Etiquettes
SEMESTER VI	
TE 2021-22	
310251	**Data Science and Big Data Analytics**
CO1	Implement and analyze behavior of web pages using HTML and CSS
CO2	Apply the client side technologies for web development
CO3	Analyze the concepts of Servlet and JSP
CO4	Analyze the Web services and frameworks
CO5	Apply the server side technologies for web development
CO6	Create the effective web applications for business functionalities using latest web development platforms
310252	**Web Technology**
CO1	Summarize temperature rise, methods of cooling of transformer and consider IS 2026 in transformer design.
CO2	Design the overall dimensions of the transformer.
CO3	Analyze the performance parameters of transformer
CO4	Design overall dimensions of three phase Induction motor
CO5	Analyze the performance parameters of three phase Induction motor
CO6	Implement and develop computer aided design of transformer and induction motor
310253	**Artificial Intelligence**
CO1	Identify and apply suitable Intelligent agents for various AI applications
CO2	Build smart system using different informed search / uninformed search or heuristic approaches

CO3	Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem
CO4	Apply the suitable algorithms to solve AI problems
CO5	Implement ideas underlying modern logical inference systems
CO6	Represent complex problems with expressive yet carefully constrained language of representation
310254(C)	**Cloud Computing**
CO1	Understand the different Cloud Computing environment
CO2	Use appropriate data storage technique on Cloud, based on Cloud application
CO3	Analyze virtualization technology and install virtualization software
CO4	Develop and deploy applications on Cloud
CO5	Apply security in cloud applications
CO6	Use advance techniques in Cloud Computing
310255	**Internship**
CO1	To demonstrate professional competence through industry internship
CO2	To apply knowledge gained through internships to complete academic activities in a professional manner
CO3	To choose appropriate technology and tools to solve given problem
CO4	To demonstrate abilities of a responsible professional and use ethical practices in day to day life.
CO5	Creating network and social circle, and developing relationships with industry people.
CO6	To analyze various career opportunities and decide carrier goals.
310256	**Data Science and Big Data Analytics Laboratory**
CO1	Apply principles of Data Science for the analysis of real time problems
CO2	Implement data representation using statistical methods
CO3	Implement and evaluate data analytics algorithms
CO4	Perform text preprocessing
CO5	Implement data visualization techniques
CO6	Use cutting edge tools and technologies to analyze Big Data
310257	**Web Technology Laboratory**
CO1	Understand the importance of website planning and website design issues
CO2	Apply the client side and server side technologies for web application development
CO3	Analyze the web technology languages, frameworks and services
CO4	Create three tier web based applications
310258	**Laboratory Practice II**
CO1	Design system using different informed search / uninformed search or heuristic approaches
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning
CO3	Design and develop an expert system
CO4	Use tools and techniques in the area of Cloud Computing
CO5	Use the knowledge of Cloud Computing for problem solving
CO6	Apply the concepts Cloud Computing to design and develop applications
	AC6-III

CO1	Express effectively through communication and improve listening skills
CO2	Develop effective team leadership abilities.
CO3	Explore self-motivation and practicing creative/new age thinking.
CO4	Operate effectively in heterogeneous teams through the knowledge of team work, people skills and leadership qualities.
SEMESTER VII	
BE 2022-23	
410241	**Design and Analysis of Algorithms**
CO1	Formulate the problem
CO2	Analyze the asymptotic performance of algorithms
CO3	Decide and apply algorithmic strategies to solve given problem
CO4	Find optimal solution by applying various methods
CO5	Analyze and Apply Scheduling and Sorting Algorithms.
CO6	Solve problems for multi-core or distributed or concurrent environments
410242	**Machine Learning**
CO1	Identify the needs and challenges of machine learning for real time applications.
CO2	Apply various data pre-processing techniques to simplify and speed up machine learning algorithms.
CO3	Select and apply appropriately supervised machine learning algorithms for real time applications.
CO4	Implement variants of multi-class classifier and measure its performance.
CO5	Compare and contrast different clustering algorithms.
CO6	Design a neural network for solving engineering problems.
410243	**Blockchain Technology**
CO1	Interpret the fundamentals and basic concepts in Blockchain.
CO2	Compare the working of different blockchain platforms.
CO3	Use Crypto wallet for cryptocurrency based transactions.
CO4	Analyze the importance of blockchain in finding the solution to the real-world problems.
CO5	Illustrate the Ethereum public block chain platform.
CO6	Identify relative application where block chain technology can be effectively used and implemented.
410244D	**Object Oriented Modeling And Design**
CO1	Describe the concepts of object-oriented and basic class modelling.
CO2	Draw class diagrams, sequence diagrams and interaction diagrams to solve problems.
CO3	Choose and apply a befitting design pattern for the given problem
CO4	To Analyze applications, architectural Styles & software control strategies
CO5	To develop Class design Models & choose Legacy Systems.
CO6	To Understand Design Patterns
410245D	**Software Testing And Quality Assurance**
CO1	Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.
CO2	Design and Develop project test plan, design test cases, test data, and conduct test operations.
CO3	Apply recent automation tool for various software testing for testing software.

CO4	Apply different approaches of quality management, assurance, and quality standard to software system.
CO5	Apply and analyze effectiveness Software Quality Tools.
CO6	Apply tools necessary for efficient testing framework.
410246	**Laboratory Practice III**
CO1	Apply preprocessing techniques on datasets.
CO2	Implement and evaluate linear regression and random forest regression models.
CO3	Apply and evaluate classification and clustering techniques.
CO4	Analyze performance of an algorithm.
CO5	Implement an algorithm that follows one of the following algorithm design strategies: divide and conquer, greedy, dynamic programming, backtracking, branch and bound.
CO6	Interpret the basic concepts in Blockchain technology and its applications
410247	**Laboratory Practice IV**
CO1	Apply android application development for solving real life problems
CO2	Design and develop system using various multimedia components.
CO3	Identify various vulnerabilities and demonstrate using various tools
CO4	Apply information retrieval tools for natural language processing
CO5	Develop an application using open source GPU programming languages
CO6	Apply software testing tools to perform automated testing
410248	**Project Stage I**
CO1	Solve real life problems by applying knowledge.
CO2	Analyze alternative approaches, apply and use most appropriate one for feasible solution.
CO3	Write precise reports and technical documents in a nutshell.
CO4	Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work
CO5	Inter-personal relationships, conflict management and leadership quality.
CO6	To Work in Team and learn professionalism
	AC7 – V: Industrial Safety and Environment Consciousness
CO1	Develop the plan for Safety performance
CO2	Demonstrate the action plan for accidents and hazards
CO3	Apply the safety and security norms in the industry
CO4	Evaluate the environmental issues of Industrialization
SEMESTER VIII	
BE 2022-23	
410250	**High Performance Computing**
CO1	Understand various Parallel Paradigm
CO2	Design and Develop an efficient parallel algorithm to solve given problem
CO3	Illustrate data communication operations on various parallel architecture
CO4	Analyze and measure performance of modern parallel computing systems
CO5	Apply CUDA architecture for parallel programming
CO6	Analyze the performance of HPC applications
410251	**Deep Learning**
CO1	Understand the basics of Deep Learning and apply the tools to implement deep learningapplications

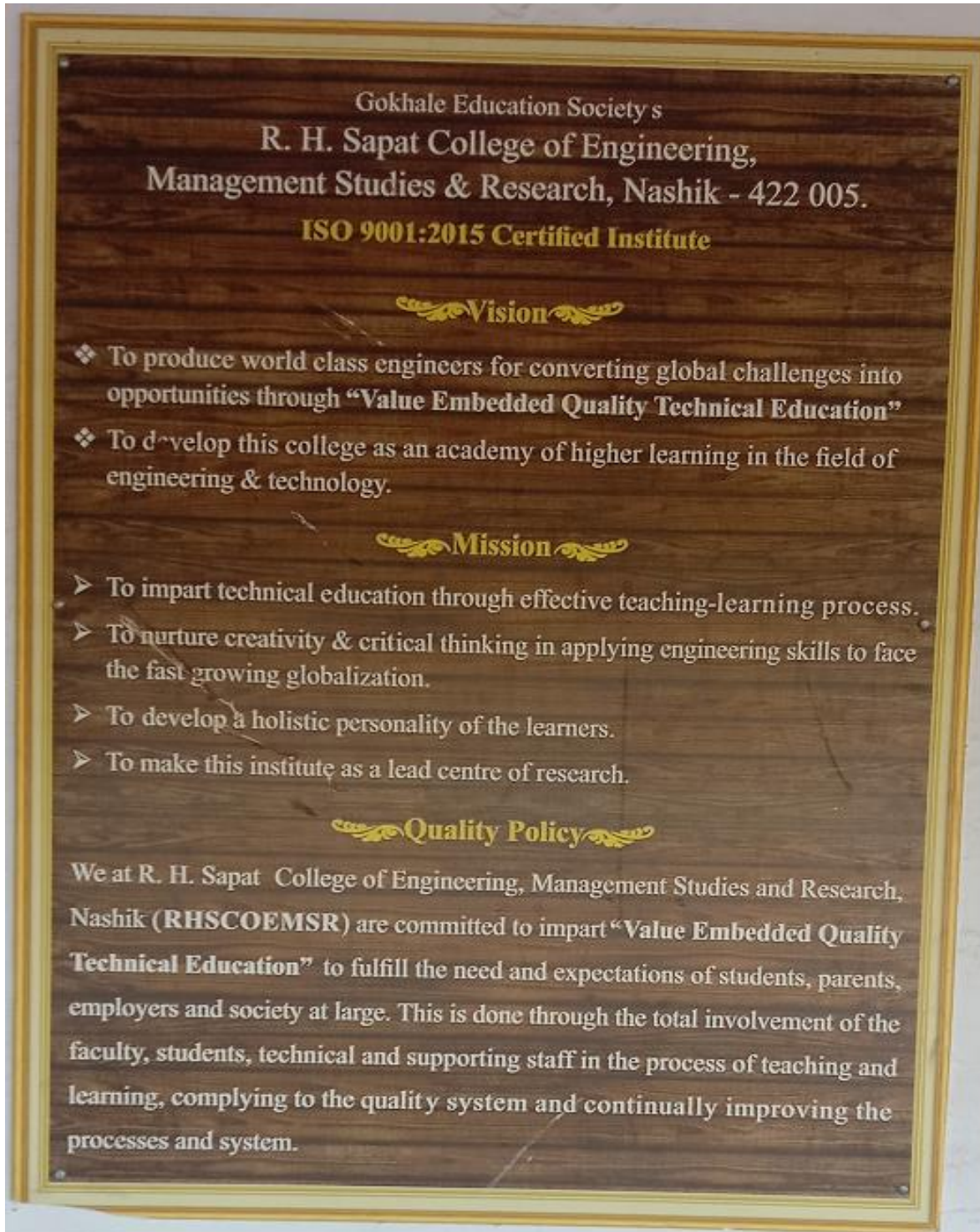| CO2	Evaluate the performance of deep learning models (e.g., with respect to the bias-variance tradeoff, overfitting and underfitting, estimation of test error).
CO3	To apply the technique of Convolution (CNN) and Recurrent Neural Network (RNN) forimplementing Deep Learning models
CO4	To implement and apply deep generative models.
CO5	Construct and apply on-policy reinforcement learning algorithms
CO6	To Understand Reinforcement Learning Process
410252(A)	**Natural Language Processing**
CO1	Describe the fundamental concepts of NLP, challenges and issues in NLP
CO2	Analyze Natural languages morphologically, syntactical and semantically OR Describe the concepts of morphology, syntax, semantics of natural language
CO3	Illustrate various language modelling techniques
CO4	Integrate the NLP techniques for the information retrieval task
CO5	Demonstrate the use of NLP tools and techniques for text-based processing of natural languages
CO6	Develop real world NLP applications
410253(B)	**Soft Computing**
CO1	Understand requirement of soft computing and be aware of various soft computing techniques.
CO2	Understand Artificial Neural Network and its characteristics and implement ANN algorithms.
CO3	Understand and Implement Evolutionary Computing Techniques.
CO4	Understand the Fuzzy logic and Implement fuzzy algorithms for solving real life problems.
CO5	Apply knowledge of Genetic algorithms for problem solving.
CO6	Develop hybrid systems for problem solving
410254	**Laboratory Practice V**
CO1	Analyze and measure performance of sequential and parallel algorithms.
CO2	Design and Implement solutions for multicore/Distributed/parallel environment.
CO3	Identify and apply the suitable algorithms to solve AI/ML problems.
CO4	Apply the technique of Deep Neural network for implementing Linear regression and classification.
CO5	Apply the technique of Convolution (CNN) for implementing Deep Learning models.
CO6	Design and develop Recurrent Neural Network (RNN) for prediction.
410255	**Laboratory Practice VI**
CO1	Apply basic principles of elective subjects to problem solving and modeling.
CO2	Use tools and techniques in the area of software development to build mini projects
CO3	Design and develop applications on subjects of their choice.
CO4	Generate and manage deployment, administration & security.
410256	**Project Work Stage II**
CO1	Solve real life problems by applying knowledge.
CO2	Analyze alternative approaches, apply and use most appropriate one for feasible solution.
CO3	Write precise reports and technical documents in a nutshell.

Back

CO4	Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work
CO5	Inter-personal relationships, conflict management and leadership quality.
CO6	To Work in Team and learn professionalism
410257	**AC8–III: Social Media And Analytics**
CO1	Develop a far deeper understanding of the changing digital land scape.
CO2	Identify some of the latest digital marketing trends and skill sets needed for today's marketer.
CO3	Successful planning, prediction, and management of digital marketing campaigns
CO4	Assess user interfaces using different usability engineering techniques.
CO5	Implement smart management of different digital assets for marketing needs.
CO6	Assess digital marketing as a long term career opportunity.

2. Display board outside departments for communicating vision, mission, POs, PEOs, PSOs.

Department of Computer Engineering

Gokhale Education Society's
R H Sapat College of Engineering, Management Studies And Research, Nashik

Department of Computer Engineering

Program Outcomes

The program outcomes (POs) are what knowledge skills and attitudes a graduate should have at the time of graduation.

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

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

PO3-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.

PO4-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.

PO5-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.

PO6-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.

PO7-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.

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

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

PO10-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.

PO11-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 multidisciplinary environments.

PO12-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.

Program Specific Outcomes

The program Specific outcomes (PSOs) are what knowledge skills and attitudes a graduate should have at the time of graduation.

PSO1-Professional Skills : The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying.

PSO2-Problem-Solving Skills : The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3-Successful Career and Entrepreneurship : The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

[Back]

Course Code	Course
GES'S RHSCOE MS & R
	Department of Electronics and Telecommunication Engineering
	Course Outcome Batch 2019-23

Course Code	Course
SEMESTER I
	FE 2019-20
107001	**Engineering Mathematics-I**
CO101.1	Mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems.
CO101.2	The Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.
CO101.3	To deal with derivative of functions of several variables that are essential in various branches of Engineering.
CO101.4	To apply the concept of Jacobian to find partial derivative of implicit function and functional dependence. Use of partial derivatives in estimating error and approximation and finding extreme values of the function.
CO101.5	The essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, finding linear and orthogonal transformations, Eigen values and Eigen vectors applicable to engineering problems
107002	**Engineering Physics**
CO102.1	Develop understanding of interference, diffraction and polarization; connect it to few engineering applications.
CO102.2	Learn basics of lasers and optical fibers and their use in some applications.
CO102.3	Understand concepts and principles in quantum mechanics. Relate them to some applications.
CO102.4	Understand theory of semiconductors and their applications in some semiconductor devices.
CO102.5	Summarize basics of magnetism and superconductivity. Explore few of their technological applications.
CO102.6	Comprehend use of concepts of physics for Non Destructive Testing. Learn some properties of nano materials and their application.
102003	**Systems in Mechanical Engineering**
CO103.1	Describe and compare the conversion of energy from renewable and non-renewable energy sources
CO103.2	Explain basic laws of thermodynamics, heat transfer and their applications
CO103.3	List down the types of road vehicles and their specifications
CO103.4	Illustrate various basic parts and transmission system of a road vehicle
CO103.5	Discuss several manufacturing processes and identify the suitable process
CO103.6	Explain various types of mechanism and its application
103004	**Basic Electrical Engineering**
CO104.1	Differentiate between electrical and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.
CO104.2	Calculate series, parallel and composite capacitor as well as characteristics parameters of alternating quantity and phasor arithmetic
CO104.3	Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram.

Back

43

CO104.4	Relate phase and line electrical quantities in polyphase networks, demonstrate the operation of single phase transformer and calculate efficiency and regulation at different loading conditions
CO104.5	Apply and analyze the resistive circuits using star-delta conversion KVL, KCL and different network theorems under DC supply
CO104.6	Evaluate work, power, and energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge.
110005	**Programming and Problem Solving**
CO105.1	Inculcate and apply various skills in problem solving
CO105.2	Choose most appropriate programming constructs and features to solve the problems in diversified domains
CO105.3	Exhibit the programming skills for the problems those require the writing of well documented programs including use of the logical constructs of language, Python.
CO105.4	Demonstrate significant experience with the Python program development environment.
111006	**Workshop Practice**
CO106.1	Familiar with safety norms to prevent any mishap in workshop.
CO106.2	Able to handle appropriate hand tool, cutting tool and machine tools to manufacture a job.
CO106.3	Able to understand the construction, working and functions of machine tools and their parts.
CO106.4	Able to know simple operations (Turning and Facing) on a centre lathe.
101007	**Environmental Studies-I**
CO107.1	Demonstrate an integrative approach to environmental issues with a focus on sustainability.
CO107.2	Explain and identify the role of the organism in energy transfers in different ecosystems.
CO107.3	Distinguish between and provide examples of renewable and nonrenewable resources & analyze personal consumption of resources.
CO107.4	Identify key threats to biodiversity and develop appropriate policy options for conserving biodiversity in different settings.
SEMESTER II	
FE 2019-20	
107008	**Engineering Mathematics – II**
CO108.1	The effective mathematical tools for solutions of first order differential equations that model physical processes such as Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc
CO108.2	Advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions needed in evaluating multiple integrals and their applications.
CO108.3	To trace the curve for a given equation and measure arc length of various curves.
CO108.4	The concepts of solid geometry using equations of sphere, cone and cylinder in a comprehensive manner.
CO108.5	Evaluation of multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.

Back

107009	**Engineering Chemistry**
CO109.1	Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity.
CO109.2	Select appropriate electro-technique and method of material analysis.
CO109.3	Demonstrate the knowledge of advanced engineering materials for various engineering applications.
CO109.4	Analyze fuel and suggest use of alternative fuels.
CO109.5	Identify chemical compounds based on their structure.
CO109.6	Explain causes of corrosion and methods for minimizing corrosion.
104010	**Basic Electronics Engineering**
CO110.1	Explain the working of P-N junction diode and its circuits.
CO110.2	Identify types of diodes and plot their characteristics and also can compare BJT with MOSFET.
CO110.3	Build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops
CO110.4	Use different electronics measuring instruments to measure various electrical parameters.
CO110.5	Select sensors for specific applications.
101011	**Engineering Mechanics**
CO111.1	Determine resultant of various force systems
CO111.2	Determine centroid, moment of inertia and solve problems related to friction
CO111.3	Determine reactions of beams, calculate forces in cables using principles of equilibrium
CO111.4	Solve trusses, frames for finding member forces and apply principles of equilibrium to forces in space
CO111.5	Calculate position, velocity and acceleration of particle using principles of kinematics
CO111.6	Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy
102012	**Engineering Graphics**
CO112.1	Draw the fundamental engineering objects using basic rules and able to construct the simple geometries.
CO112.2	Construct the various engineering curves using the drawing instruments.
CO112.3	Apply the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object.
CO112.4	Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.
CO112.5	Draw the development of lateral surfaces for cut section of geometrical solids.
CO112.6	Draw fully-dimensioned 2D, 3D drawings using computer aided drafting tools.
110013	**Project Based Learning**
CO113.1	Project based learning will increase their capacity and learning through shared cognition.
CO113.2	Students able to draw on lessons from several disciplines and apply them in practical way.
CO113.3	Learning by doing approach in PBL will promote long-term retention of material and replicable skill, as well as improve teachers' and students'

Back

	attitudes towards learning.
101014	**Environmental Studies-II**
CO114.1	Have an understanding of environmental pollution and the science behind those problems and potential solutions.
CO114.2	Have knowledge of various acts and laws and will be able to identify the industries that are violating these rules.
CO114.3	Assess the impact of ever increasing human population on the biosphere: social, economic issues and role of humans in conservation of natural resources.
CO114.4	Learn skills required to research and analyze environmental issues scientifically and learn how to use those skills in applied situations such as careers that may involve environmental problems and/or issues
SEMESTER III
SE 2020-21
207005	**Engineering Mathematics-III**
CO201.1	Solve higher order linear differential equation using appropriate techniques for modelling, analyzing of
CO201.2	Apply concept of Fourier transform & Z-transform and its applications to continuous & discrete systems,
CO201.3	Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific
CO201.4	Perform vector differentiation and their application to electro- magnetic fields
CO201.5	Perform vector integration, analyze the vector fields and apply to wave theory.
CO201.6	Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, digital
204181	**Electronic Circuits**
CO202.1	Semiconductor device MOSFET, its characteristics, parameters & applications.
CO202.2	Concepts of feedbacks in amplifiers & oscillators.
CO202.3	Operational amplifier, concept, parameters & applications.
CO202.4	ADC, DAC as an interface between analog & digital domains.
CO202.5	Voltage to current and current to voltage converters.
CO202.6	Concepts, characteristics & applications of PLL.
204182	**Digital Circuits**
CO203.1	Identify and prevent various hazards and timing problems in a digital design.
CO203.2	Use the basic logic gates and various reduction techniques of digital logic circuit.
CO203.3	Use the basic logic gates and various reduction techniques of digital logic circuit.
CO203.4	Analyze, design and implement sequential circuits.
CO203.5	Differentiate between Mealy and Moore machines.
CO203.6	Analyze digital system design using PLD.
204183	**Electrical Circuits**
CO204.1	Analyze the simple DC and AC circuit with circuit simplification techniques.
CO204.2	Formulate and analyze driven and source free RL and RC circuits.
CO204.3	Formulate & determine network parameters for given network and analyze the

Back

46

	given network using
CO204.4	Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC
CO204.5	Analyze the simple DC and AC circuit with circuit simplification techniques.
CO204.6	Formulate and analyze driven and source free RL and RC circuits.
204184	**Data Structures**
CO205.1	Solve mathematical problems using C programming language.
CO205.2	Implement sorting and searching algorithms and calculate their complexity.
CO205.3	Develop applications of stack and queue using array
CO205.4	Demonstrate applicability of Linked List
CO205.5	Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
CO205.6	Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm.
204185	**Electronic Circuit Lab**
CO206.1	Semiconductor device MOSFET, its characteristics, parameters & applications.
CO206.2	Concepts of feedbacks in amplifiers & oscillators.
CO206.3	Operational amplifier, concept, parameters & applications.
CO206.4	ADC, DAC as an interface between analog & digital domains.
	Voltage to current and current to voltage converters.
	Concepts, characteristics & applications of PLL.
204186	**Digital circuits Lab**
CO207.1	Use the basic logic gates and various reduction techniques of digital logic circuit.
CO207.2	Analyze, design and implement combinational logic circuits.
CO207.3	Analyze, design and implement sequential circuits.
204187	**Electrical Circuit Lab**
CO208.1	Analyze the simple DC and AC circuit with circuit simplification techniques.
CO208.2	Formulate and analyze driven and source free RL and RC circuits.
CO208.3	Formulate & determine network parameters for given network and analyze the given network using Laplace
CO208.4	Explain construction, working and applications of DC Machines / Single Phase & Three Phase AC Motors.
CO208.5	Explain construction, working and applications of special purpose motors & understand motors used in elect
CO208.6	Analyze and select a suitable motor for different applications
204188	**Data Structures Lab**
CO209.1	Solve mathematical problems using C programming language.
CO209.2	Implement sorting and searching algorithms and calculate their complexity.
CO209.3	Develop applications of stack and queue using array
CO209.4	Demonstrate applicability of Linked List
CO209.5	Demonstrate applicability of nonlinear data structures - Binary Tree with respect to its time complexity.
CO209.6	Apply the knowledge of graph for solving the problems of spanning tree and shortest path algorithm.

Back

204189	**Electronic Skill Development**
CO210.1	Understanding of bread board in the view of circuit development.
CO210.2	Understanding layout of PCB using PCB design software
CO210.3	Understanding Assembly, SMD Overview, Power Budgeting, Batteries.
204190	**Audit Course 3**
CO211.1	Understanding of words of foreign languages and use of words in sentences
CO211.2	Use of foreign languages to understand the cutting edge technologies in locally and globally.
SEMESTER IV
	SE 2020-21
204191	**Signals & Systems**
CO212.1	To equip/ familiarize students with basic mathematical tools for time and frequency domain analysis.
CO212.2	To understand the mathematical representation of continuous and discrete time signals and system.
CO212.3	To classify signals and systems into different categories.
CO212.4	To analyze Linear Time Invariant (LTI) systems in time and transform domains.
CO212.5	To build basics for understanding of courses such as signal processing, control system and communication
CO212.6	To develop basis of probability and random variables.
204192	**Control Systems**
CO213.1	Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO213.2	Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO213.3	Perform time domain analysis of control systems required for stability analysis
CO213.4	Perform frequency domain analysis of control systems required for stability analysis.
CO213.5	Apply root-locus, Frequency Plots technique to analyze control systems.
CO213.6	Express and solve system equations in state variable form.
CO213.7	Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.
204193	**Principles of Communication Systems**
CO214.1	To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study
CO214.2	Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.
CO214.3	Explain generation and detection of FM systems and compare with AM systems.
CO214.4	Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM)
CO214.5	Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).
CO214.6	Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.

Back

204194	**Object Oriented Programming**
CO215.1	Describe the principles of object oriented programming.
CO215.2	Apply the concepts of data encapsulation, inheritance in C++.
CO215.3	Understand Operator overloading and friend functions in C++.
CO215.4	Apply the concepts of classes, methods inheritance and polymorphism to write programs C++
CO215.5	Apply Templates, Namespaces and Exception Handling concepts to write programs in C++
CO215.6	Describe and use of File handling in C++
204195	**Signals & Control System Lab**
CO216.1	Identify, classify basic signals and perform operations on signals
CO216.2	Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.
CO216.3	Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.
CO216.4	Resolve the signals in complex frequency domain using Laplace Transform, and will be able to apply and analyze the LTI systems using Laplace Transforms.
CO216.5	Define and Describe the probability, random variables and random signals. Compute the probability of a given event, model, compute the CDF and PDF.
CO216.6	Compute the mean, mean square, variance and standard deviation for given random variables using PDF.
CO216.7	Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO216.8	Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.
CO216.9	Perform time domain analysis of control systems required for stability analysis
CO216.10	Perform frequency domain analysis of control systems required for stability analysis.
CO216.11	Apply root-locus, Frequency Plots technique to analyze control systems.
CO216.12	Express and solve system equations in state variable form.
CO216.13	Differentiate between various digital controllers and understand the role of the controllers in Industrial automation.
204196	**Principles of Communication Systems Lab**
CO217.1	To compute & compare the bandwidth and transmission power requirements by analyzing time and frequency domain spectra of signal required for modulation schemes under study
CO217.2	Describe and analyze the techniques of generation, transmission and reception of Amplitude Modulation Systems.
CO217.3	Explain generation and detection of FM systems and compare with AM systems.
CO217.4	Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation technique (PAM, PWM, and PPM)
CO217.5	Characterize the quantization process and elaborate digital representation techniques (PCM, DPCM, DM and ADM).

CO217.6	Illustrate waveform coding, multiplexing and synchronization techniques and articulate their importance in baseband digital transmission.
204197	**Object Oriented Programming Lab**
CO218.1	Apply the concepts of data encapsulation, inheritance in C++.
CO218.2	Apply the concept of Operator overloading and friend functions in C++.
CO218.3	Apply the concepts of classes, methods inheritance and polymorphism to write programs C++
CO218.4	Apply Templates, Namespaces and Exception Handling concepts to write programs in C++
204198	**Data Analytics Lab**
CO219.1	Understanding of fundamentals of data science.
CO219.2	Understanding of various Python packages related to data science.
CO219.3	Writing Python programs related to data sequences using NumPy and Pandas.
CO219.4	Writing Python programs related to data frames using NumPy and Pandas.
204199	**Employability Skill Development**
CO220.1	Define personal and career goals using introspective skills and SWOC assessment. Outline and evaluate short-term and long-term goals.
CO220.2	Develop effective communication skills (listening, reading, writing, and speaking), self- management attributes, problem solving abilities and team working & building capabilities in order to fetch employment opportunities and further succeed in the workplace.
CO220.3	Be a part of a multi-cultural professional environment and work effectively by enhancing inter-personal relationships, conflict management and leadership skills.
CO220.4	Comprehend the importance of professional ethics, etiquettes & morals and demonstrate sensitivity towards it throughout certified career.
CO220.5	Develop practically deployable skill set involving critical thinking, effective presentations and leadership qualities to hone the opportunities of employability and excel in the professional environment.
204200	**Project Based Learning**
CO221.1	Identify the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aim and objectives.
CO221.2	Contribute to society through proposed solution by strictly following professional ethics and safety measures.
CO221.3	Propose a suitable solution based on the fundamentals of electronics and communication engineering by possibly the integration of previously acquired knowledge.
CO221.4	Analyze the results and arrive at valid conclusion.
CO221.5	Use of technology in proposed work and demonstrate learning in oral and written form.
CO221.6	Develop ability to work as an individual and as a team member.
204201	**Audit Course-4**
CO222.1	Understanding the philosophy of human values.
CO222.2	Mitigating the gaps of human psychology and technology.
SEMESTER V
TE 2021-22
304181	**Digital Communication**

CO301.1	Apply the statistical theory for describing various signals in a communication system systems
CO301.2	Understand and explain various digital modulation techniques used in digital communication systems and analyze their performance in presence of AWGN noise.
CO301.3	Describe and analyze the digital communication system with spread spectrum modulation.
CO301.4	Analyze a communication system using information theoretic approach.
CO301.5	Use error control coding techniques to improve performance of a digital communication system.
CO301.6	Apply the statistical theory for describing various signals in a communication system systems
304182	**Electromagnetic Field Theory**
CO302.1	Apply the basic electromagnetic principles and determine the fields (E & H) due to the given source.
CO302.2	Apply boundary conditions to the boundaries between various media to interpret behavior of the fields on either sides.
CO302.3	State, Identify and Apply Maxwell's equations (integral and differential forms) in both the forms (Static, time-varying or Time-harmonic field) for various sources, Calculate the time average power density using Poynting Theorem, Retarded magnetic vector potential.
CO302.4	Formulate, Interpret and solve simple uniform plane wave (Helmholtz Equations) equations, and analyze the incident/reflected/transmitted waves at normal incidence.
CO302.5	Interpret and Apply the transmission line equation to transmission line problems with load impedance to determine input and output voltage/current at any point on the Transmission line, Find input/load impedance, input/load admittance, reflection coefficient, SWR, Vmax/Vmin, length of transmission line using Smith Chart.
CO302.6	Carry out a detailed study, interpret the relevance and applications of Electromagnetics.
304183	**Database Management**
CO303.1	Ability to implement the underlying concepts of a database management system.
CO303.2	Design and implement a database schema for a given problem-domain using data model.
CO303.3	Formulate using SQL/DML/DDL commands, solutions to a wide range of query and update problems.
CO303.4	Implement transactions, concurrency control and be able todo database recovery.
CO303.5	Able to understand various parallel database architecture and its applications.
CO303.6	Able to understand various distributed databases and its applications.
304184	**Microcontrollers**
CO304.1	Understand the fundamentals of microcontroller and programming.
CO304.2	Interface various electronic components with microcontrollers.
CO304.3	Analyze the features of PIC 18F XXXX.
CO304.4	Describe the programming details in peripheral support
CO304.5	Develop interfacing models according to applications.

Back

51

CO304.6	Evaluate the serial communication details and interfaces.
304185 - 3	**Elective I: Fundamentals of JAVA Programming**
CO305.1	Understand the basic principles of Java programming language
CO305.2	Apply the concepts of classes and objects to write programs in Java
CO305.3	Demonstrate the concepts of methods & Inheritance
CO305.4	Use the concepts of interfaces & packages for program implementation
CO305.5	Understand multithreading and Exception handling in Java to develop robust programs
CO305.6	Use Graphics class, AWT packages and manage input and output files in Java
304186	**Digital Communication Lab**
CO306.1	Apply the statistical theory for describing various signals in a communication system.
CO306.2	Understand and explain various digital modulation techniques used in digital communication systems and analyze their performance in presence of AWGN noise.
CO306.3	Describe and analyze the digital communication system with spread spectrum modulation.
CO306.4	Analyze a communication system using information theoretic approach.
	Use error control coding techniques to improve performance of a digital communication system.
304187	**Database Management Lab**
CO307.1	Ability to implement the underlying concepts of a database management system.
CO307.2	Design and implement a database schema for a given problem-domain using data model.
CO307.3	Formulate using SQL/DML/DDL commands, solutions to a wide range of query and update problems.
CO307.4	Implement transactions, concurrency control and be able to do database recovery.
CO307.5	Able to understand various parallel database architecture and its applications.
CO307.6	Able to understand various distributed databases and its applications.
304188	**Microcontroller Lab**
CO308.1	Understand the fundamentals of microcontroller and programming.
CO308.2	Interface various electronic components with microcontrollers.
CO308.3	Analyze the features of PIC 18F XXXX.
CO308.4	Describe the programming details in peripheral support
CO308.5	Develop interfacing models according to applications.
CO308.6	Evaluate the serial communication details and interfaces.
304189	**Elective I: Fundamentals of JAVA Programming Lab**
CO309.1	Understand the basic principles of Java programming language
CO309.2	Apply the concepts of classes and objects to write programs in Java
CO309.3	Demonstrate the concepts of methods & Inheritance
CO309.4	Use the concepts of interfaces & packages for program implementation
CO309.5	Understand multithreading and Exception handling in Java to develop robust programs
CO309.6	Use Graphics class, AWT packages and manage input and output files in Java
304190	**Skill development**

CO310.1	Student should recognize the need to engage in independent and life-long learning in required skill sets
CO310.2	Student needs to experience the impact of industries on society by visiting different industries and understand the importance of industrial products for analog and digital circuits and systems
CO310.3	Student has to make use of the modern electronic and IT Engineering Tools and Technologies for solving electronic engineering problems.
CO310.4	Student would be able to communicate effectively at different technical and administrative levels
CO310.5	Student will exhibit leadership skills both as an individual and as a member in a team in multidisciplinary environment.
304191A - B	**Audit Course 5**
CO311.1	Development of startup ideas in the view of product development
CO311.2	Understanding of Intellectual property rights in the view of procedure for registering patents
SEMESTER VI	
TE 2021-22	
304192	**Cellular Networks**
CO312.1	Understand fundamentals of wireless communications.
CO312.2	Discuss and study OFDM and MIMO concepts.
CO312.3	Elaborate fundamentals mobile communications.
CO312.4	Describes aspects of wireless system planning.
CO312.5	Understand modern and futuristic wireless network architecture.
CO312.6	Summarize different issues in performance analysis.
304193	**Project Management**
CO313.1	Apply the fundamental knowledge of project management for effectively handling the projects.
CO313.2	Identify and select the appropriate project based on feasibility study and undertake its effective planning.
CO313.3	Assimilate effectively within the organizational structure of project and handle project management related issues in an efficient manner.
CO313.4	Apply the project scheduling techniques to create a Project Schedule Plan and accordingly utilize the resources to meet the project deadline
CO313.5	Identify and assess the project risks and manage finances in line with Project Financial Management Process.
CO313.6	Develop new products assessing their commercial viability and develop skillsets for becoming successful entrepreneurs while being fully aware of the legal issues related to Product development and Entrepreneurship.
304194	**Power Devices & Circuits**
CO314.1	To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings
CO314.2	To design triggering / driver circuits for various power devices.
CO314.3	To evaluate and analyze various performance parameters of the different converters and its topologies.
CO314.4	To understand significance and design of various protections circuits for power devices.
CO314.5	To evaluate the performance of uninterruptible power supplies, switch mode

	power supplies and battery
CO314.6	To understand case studies of power electronics in applications like electric vehicles, solar systems etc.
304195 - 3	**Elective II: Advanced JAVA Programming**
CO315.1	Design and develop GUI applications using Applets.
CO315.2	Apply relevant AWT/ swing components to handle the given event.
CO315.3	Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event handling.
CO315.4	Learn to access database through Java programs, using Java Database Connectivity (JDBC)
CO315.5	Invoke the remote methods in an application using Remote Method Invocation (RMI)
CO315.6	Develop program for client /server communication using Java Networking classes.
304196	**Cellular Networks Lab**
CO316.1	Understand fundamentals of wireless communications.
CO316.2	Discuss and study OFDM and MIMO concepts.
CO316.3	Elaborate fundamentals mobile communications.
CO316.4	Describes aspects of wireless system planning.
CO316.5	Understand modern and futuristic wireless network architecture.
CO316.6	Summarize different issues in performance analysis.
304197	**Power Devices & Circuits Lab**
CO317.1	To differentiate based on the characteristic parameters among SCR, GTO, MOSFET & IGBT and identify suitability of the power device for certain applications and understand the significance of device ratings
CO317.2	To design triggering / driver circuits for various power devices.
CO317.3	To evaluate and analyze various performance parameters of the different converters and its topologies.
CO317.4	To understand significance and design of various protections circuits for power devices.
CO317.5	To evaluate the performance of uninterruptible power supplies, switch mode power supplies and battery
CO317.6	To understand case studies of power electronics in applications like electric vehicles, solar systems etc.
304198	**Elective II Advanced JAVA Programming Lab**
CO318.1	Design and develop GUI applications using Applets.
CO318.2	Apply relevant AWT/ swing components to handle the given event.
CO318.3	Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event handling.
CO318.4	Learn to access database through Java programs, using Java Database Connectivity (JDBC)
CO318.5	Invoke the remote methods in an application using Remote Method Invocation (RMI)
CO318.6	Develop program for client /server communication using Java Networking classes.
304199	**Internship**
CO319.1	To develop professional competence through internship
CO319.2	To apply academic knowledge in a personal and professional environment.

CO319.3	To build the professional network and expose students to future employees.
CO319.4	Apply professional and societal ethics in their day to day life.
CO319.5	To become a responsible professional having social, economic and administrative considerations
CO319.6	To make own career goals and personal aspirations.
304200	**Mini Project**
CO320.1	Understand, plan and execute a Mini Project with team.
CO320.2	Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
CO320.3	Prepare a technical report based on the Mini project.
CO320.4	Deliver technical seminar based on the Mini Project work carried out.
304191B-A	**Audit Course 6**
CO321.1	Understanding of patent Laws
CO321.2	Understanding steps involved in registration of patents.
SEMESTER VII	
BE 2022-23	
404181	**Radiation & Microwave Theory**
CO401.1	Apply the fundamentals of electromagnetic to derive free space propagation equation and distinguish various performance parameters of antenna.
CO401.2	Identify various modes in the waveguide. Compare: coaxial line, rectangular waveguides & striplines and identify applications of the same.
CO401.3	Explore construction and working of principles passive microwave devices/components.
CO401.4	Explore construction and working of principles active microwave devices/components.
CO401.5	Analyze the structure, characteristics, operation, equivalent circuits and applications of various microwave solid state active devices.
CO401.6	Know the various microwave systems, device set ups of microwave measurement devices and Identify the effect of radiations on environmental sustainability.
404182	**VLSI Design and Technology**
CO402.1	Develop effective HDL codes for digital design.
CO402.2	Apply knowledge of real time issues in digital design.
CO402.3	Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO402.4	Design CMOS circuits for specified applications.
CO402.5	Analyze various issues and constraints in design of an ASIC.
CO402.6	Apply knowledge of testability in design and Build In Self Test (BIST) circuit.
404183	**Cloud Computing**
CO403.1	Understand the basic concepts of Cloud Computing.
CO403.2	Describe the underlying principles of different Cloud Service Models.
CO403.3	Classify the types of Virtualization.
CO403.4	Examine the Cloud Architecture and understand the importance of Cloud Security.
CO403.5	Develop applications on Cloud Platforms.
CO403.6	Evaluate distributed computing and the Internet of Things.
404184-2	**Elective III: PLC SCADA & Automation**
CO404.1	Understand and Recognize Industrial Control Problems

CO404.2	Analyze & explain different hardware functions of PLC
CO404.3	Develop Ladder Programming in PLC and PLC Interface in real time applications.
CO404.4	Explore and interpret functionality of SCADA.
CO404.5	Identify and interpret the functionality of DCS
CO404.6	Define and explain CNC machines and Applications of Industrial Protocols.
404185-1	**Elective IV: Data Mining**
CO405.1	Understand and explain design flow of design of electronics product
CO405.2	Associate with various circuit design issues and testing
CO405.3	Inferring different software designing aspects and the Importance of product test & test specifications.
CO405.4	Summarizing printed circuit boards and different parameters.
CO405.5	Estimating assorted product design aspects
CO405.6	Exemplifying special design considerations and importance of documentation.
404186	**Lab Practice - 1 (RMT & Cloud Computing)**
CO406.1	Apply the fundamentals of electromagnetic to derive free space propagation equation and distinguish various performance parameters of antenna.
CO406.2	Identify various modes in the waveguide. Compare: coaxial line, rectangular waveguides & striplines and identify applications of the same.
CO406.3	Explore construction and working of principles passive microwave devices/components.
CO406.4	Explore construction and working of principles active microwave devices/components.
CO406.5	Analyze the structure, characteristics, operation, equivalent circuits and applications of various microwave solid state active devices.
CO406.6	Know the various microwave systems, device set ups of microwave measurement devices and Identify the effect of radiations on environmental sustainability.
CO406.7	Understand the basic concepts of Cloud Computing.
CO406.8	Describe the underlying principles of different Cloud Service Models.
CO406.9	Classify the types of Virtualization.
CO406.10	Examine the Cloud Architecture and understand the importance of Cloud Security.
CO406.11	Develop applications on Cloud Platforms.
CO406.12	Evaluate distributed computing and the Internet of Things.
404187	**Lab Practice - 2 VLSI Design & Elective -3 Lab**
CO407.1	Develop effective HDL codes for digital design.
CO407.2	Apply knowledge of real time issues in digital design.
CO407.3	Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
CO407.4	Design CMOS circuits for specified applications.
CO407.5	Analyze various issues and constraints in design of an ASIC.
CO407.6	Apply knowledge of testability in design and Build In Self Test (BIST) circuit.
CO407.7	Understand and Recognize Industrial Control Problems
CO407.8	Analyze & explain different hardware functions of PLC
CO407.9	Develop Ladder Programming in PLC and PLC Interface in real time applications.
CO407.10	Explore and interpret functionality of SCADA.

Back

CO407.11	Identify and interpret the functionality of DCS
CO407.12	Define and explain CNC machines and Applications of Industrial Protocols.
404188	**Project Stage - I**
CO408.1	Demonstrate a sound technical knowledge in field of E&TC in the form of project
CO408.2	Undertake real life problem identification, formulation and solution
CO408.3	Design engineering solutions to complex problems utilizing a systematic approach.
CO408.4	Demonstrate the knowledge, effective communication skills and attitudes as professional engineer.
404189	**Audit Course-7**
CO409.1	Understanding patent search process
CO409.2	Writing stages of patent analysis
	SEMESTER VIII
	BE 2022-23
404190	**Fiber Optic Communication**
CO410.1	Explain the working of components and measurement equipments in optical fiber networks.
CO410.2	Calculate the important parameters associated with optical components used in fiber optic telecommunication systems.
CO410.3	Compare and contrast the performance of major components in optical links.
CO410.4	Evaluate the performance viability of optical links using the power and rise time budget analysis.
CO410.5	Design digital optical link by proper selection of components and check its viability using simulation tools.
CO410.6	Compile technical information related to state of art components, standards, simulation tools and current technological trends by accessing the online resources to update their domain knowledge.
404191-5	**Elective - 5 Mobile Computing**
CO411.1	Understand concepts of Mobile Communication.
CO411.2	Analyse next generation Mobile Communication System.
CO411.3	Understand network layers of Mobile Communication.
CO411.4	Understand IP and Transport layers of Mobile Communication.
CO411.5	Study of different mathematical models.
CO411.6	Understand different mobile applications.
404192-4	**Elective 6: Digital Marketing**
CO412.1	To understand digital marketing & process of website design.
CO412.2	To identify the keywords for a website & understand the SEO.
CO412.3	To study the various Digital Marketing Tools.
CO412.4	To learn the use of social media websites for Digital Marketing.
CO412.5	To be conversant with Linked In platform.
CO412.6	To know the recent trends in Digital Marketing.
404193	**Innovation & Entrepreneurship**
CO413.1	Understand Innovation, Entrepreneurship and characteristics of an entrepreneur.
CO413.2	Develop a strong understanding of the Design Process and its application in variety of business settings.
CO413.3	Generate sustainable ideas.

CO413.4	Explore various processes required to be an entrepreneur.
CO413.5	Understand patents and its process of filing.
CO413.6	Choose and use appropriate social media for marketing
404194	**Digital Business Management**
CO414.1	Identify drivers of digital business
CO414.2	Illustrate various approaches and techniques for E-business and management.
CO414.3	Prepare E-business plan.
404195	**Fiber Optic Lab**
CO415.1	Explain the working of components and measurement equipments in optical fiber networks.
CO415.2	Calculate the important parameters associated with optical components used in fiber optic telecommunication systems.
CO415.3	Compare and contrast the performance of major components in optical links.
CO415.4	Evaluate the performance viability of optical links using the power and rise time budget analysis.
CO415.5	Design digital optical link by proper selection of components and check its viability using simulation tools.
CO415.6	Compile technical information related to state of art components, standards, simulation tools and current technological trends by accessing the online resources to update their domain knowledge.
404196	**Lab Practice - 3 Elective 5 Mobile Computing**
CO416.1	Understand concepts of Mobile Communication.
CO416.2	Analyse next generation Mobile Communication System.
CO416.3	Understand network layers of Mobile Communication.
CO416.4	Understand IP and Transport layers of Mobile Communication.
CO416.5	Study of different mathematical models.
CO416.6	Understand different mobile applications.
404197	**Project stage II**
CO417.1	Demonstrate a sound technical knowledge in field of E&TC in the form of project
CO417.2	Undertake real life problem identification, formulation and solution
CO417.3	Design engineering solutions to complex problems utilizing a systematic approach.
CO417.4	Demonstrate the knowledge, effective communication skills and attitudes as professional engineer.

2. Display board outside departments for communicating vision, mission, POs, PEOs, PSOs.

Department of Electronics & Telecommunication Engineering

Gokhale Education Society's
R H Sapat College of Engineering, Management Studies And Research, Nashik

Department of Electronics and Telecommunication Engineering

Program Outcomes as defined by NBA (PO)

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 problem: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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

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

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

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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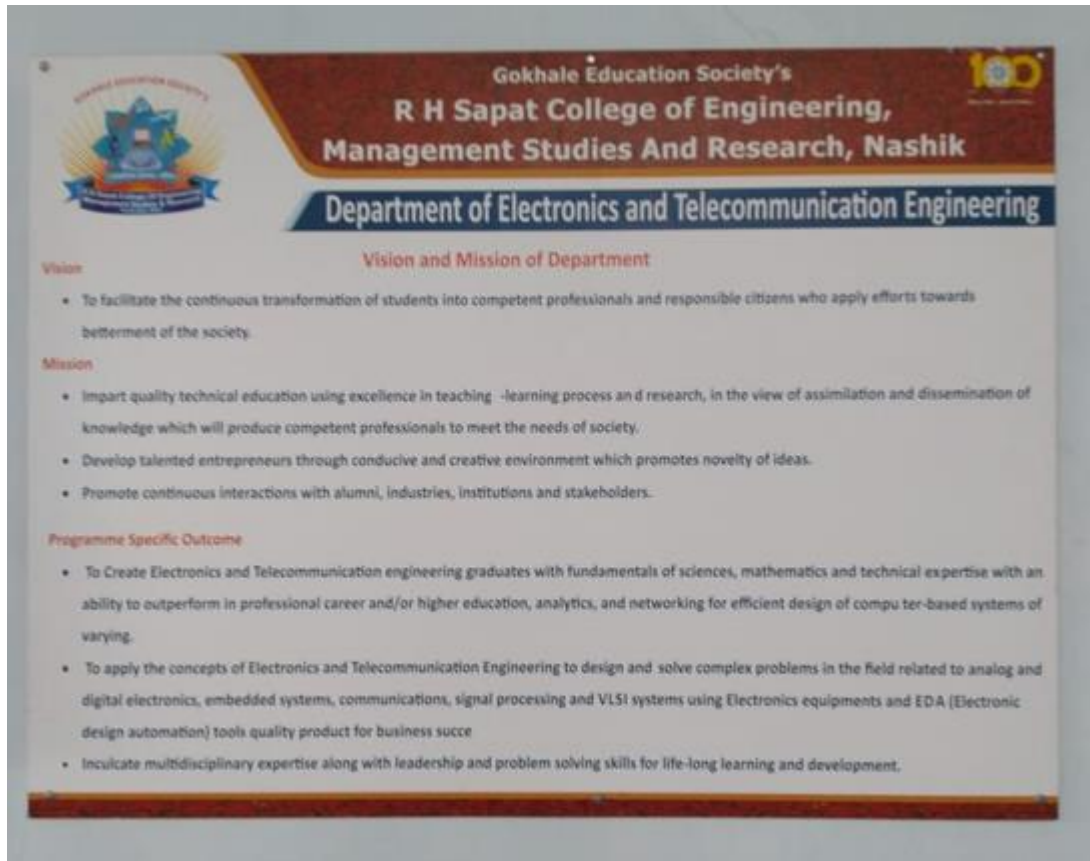
[Back](#)

Gokhale Education Society's
R H Sapat College of Engineering, Management Studies And Research, Nashik

Department of Electronics and Telecommunication Engineering

Vision and Mission of Department

Vision:
- To facilitate the continuous transformation of students into competent professionals and responsible citizens who apply efforts towards betterment of the society.

Mission:
- Impart quality technical education using excellence in teaching -learning process and research, in the view of assimilation and dissemination of knowledge which will produce competent professionals to meet the needs of society.
- Develop talented entrepreneurs through conducive and creative environment which promotes novelty of ideas.
- Promote continuous interactions with alumni, industries, institutions and stakeholders.

Programme Specific Outcome
- To Create Electronics and Telecommunication engineering graduates with fundamentals of sciences, mathematics and technical expertise with an ability to outperform in professional career and/or higher education, analytics, and networking for efficient design of computer-based systems of varying.
- To apply the concepts of Electronics and Telecommunication Engineering to design and solve complex problems in the field related to analog and digital electronics, embedded systems, communications, signal processing and VLSI systems using Electronics equipments and EDA (Electronic design automation) tools quality product for business succe
- Inculcate multidisciplinary expertise along with leadership and problem solving skills for life-long learning and development.

Back

Department of Mechanical Engineering

Course Outcomes For Batch 2019-2023	
Course Code	**Course**
	F.E.2019-20
	Semester-I
	Subject - Systems in Mechanical Engg. **Subject Code-102003**
CO1	Describe and compare the conversion of energy from renewable and non-renewable energy sources
CO2	Explain basic laws of thermodynamics, heat transfer and their applications
CO3	List down the types of road vehicles and their specifications
CO4	Illustrate various basic parts and transmission system of a road vehicle
CO5	Discuss several manufacturing processes and identify the suitable process
CO6	Explain various types of mechanism and its application
	Semester-II
	Subject – Engineering Graphics **Subject Code-102012**
CO1	Draw the fundamental engineering objects using basic rules and able to construct the simple geometries
CO2	Construct the various engineering curves using the drawing instruments.
CO3	Apply the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object.
CO4	Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.
CO5	Draw the development of lateral surfaces for cut sections of geometrical solids.
CO6	Draw fully-dimensioned 2D, 3D drawings using computer aided drafting tools.
	Semester-III
	Subject - Engineering Thermodynamics **Subject Code-202043**
CO1	DESCRIBE the basics of thermodynamics with heat and work interactions
CO2	APPLY laws of thermodynamics to steady flow and non-flow processes.
CO3	APPLY entropy, available and non-available energy for an Open and Closed System,
CO4	DETERMINE the properties of steam and their effect on performance of vapor power cycle

BACK

Course Outcomes For Batch 2019-2023	
CO5	ANALYZE the fuel combustion process and products of combustion.
CO6	SELECT various instrumentations required for safe and efficient operation of steam generator
	Subject - Solid Mechanics **Subject Code-202041**
CO1	DEFINE various types of stresses and strain developed on determinate and indeterminate members.
CO2	DRAW Shear force and bending moment diagram for various types of transverse loading and support
CO3	COMPUTE the slope & deflection, bending stresses and shear stresses on a beam
CO4	CALCULATE torsional shear stress in shaft and buckling on the column
CO5	APPLY the concept of principal stresses and theories of failure to determine stresses on a 2-D element
CO6	UTILIZE the concepts of SFD & BMD, torsion and principal stresses to solve combined loading application based problems.
	Subject - Solid Modeling and Drafting **Subject Code-202042**
CO1	UNDERSTAND basic concepts of CAD system, need and scope in Product Lifecycle Management
CO2	UTILIZE knowledge of curves and surfacing features and methods to create complex solid geometry
CO3	CONSTRUCT solid models, assemblies using various modeling techniques & PERFORM mass property analysis, including creating and using a coordinate system
CO4	APPLY geometric transformations to simple 2D geometries
CO5	USE CAD model data for various CAD based engineering applications viz. production drawings, 3D printing, FEA, CFD, MBD, CAE, CAM, etc.
CO6	USE PMI & MBD approach for communication
	Subject -Engineering Materials and Metallurgy **Subject Code-20244**
CO1	COMPARE crystal structures and ASSESS different lattice parameters.
CO2	CORRELATE crystal structures and imperfections in crystals with mechanical behavior of materials
CO3	DIFFERENTIATE and DETERMINE mechanical properties using destructive and nondestructive testing of materials.

BACK

63

Course Outcomes For Batch 2019-2023	
CO4	IDENTIFY & ESTIMATE different parameters of the system viz., phases, variables, component, grains, grain boundary, and degree of freedom. etc.
CO5	ANALYZE effect of alloying element & heat treatment on properties of ferrous & nonferrous alloy
CO6	SELECT appropriate materials for various applications.
	Subject - Electrical and Electronics Engineering **Subject Code-203156**
CO1	APPLY programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems
CO2	DEVELOP interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board
CO3	UNDERSTAND the operation of DC motor, its speed control methods and braking
CO4	DISTINGUISH between types of three phase induction motor and its characteristic features
CO5	EXPLAIN about emerging technology of Electric Vehicle (EV) and its modular subsystems
CO6	CHOOSE energy storage devices and electrical drives for EVs
	Subject - Geometric Dimensioning and Tolerancing Lab **Subject Code-20245**
CO1	SELECT appropriate IS and ASME standards for drawing
CO2	READ & ANALYZE variety of industrial drawings
CO3	APPLY geometric and dimensional tolerance, surface finish symbols in drawing
CO4	EVALUATE dimensional tolerance based on type of fit, etc.
CO5	SELECT an appropriate manufacturing process using DFM, DFA, etc
	Subject -Audit Course III Technical English for Engineers Subject Code-202046
CO1	Able to listen, understand, comprehend technical english and able to communicate in correct english
CO2	Able to understand the paragraph and interpret its correct context
CO3	Able to write reports ,resume and technical reports in proper english language
	S.E 2020-21 Semester-IV
	Subject - Engineering Mathematics – III **Subject Code-207002**
CO1	SOLVE higher order linear differential equations and its applications to model and analyze mass spring systems

BACK

	Course Outcomes For Batch 2019-2023
CO2	APPLY Integral transform techniques such as Laplace transform and Fourier transform to solve differential equations involved in vibration theory, heat transfer and related mechanical engineering applications
CO3	APPLY Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering and probability theory in testing and quality control
CO4	PERFORM Vector differentiation & integration, analyze the vector fields and APPLY to fluid flow problems.
CO5	SOLVE Partial differential equations such as wave equation, one and two dimensional heat flow equations
	Subject - Kinematics of Machinery **Subject Code-202047**
CO1	APPLY kinematic analysis to simple mechanisms
CO2	ANALYZE velocity and acceleration in mechanisms by vector and graphical method
CO3	SYNTHESIZE a four bar mechanism with analytical and graphical methods
CO4	APPLY fundamentals of gear theory as a prerequisite for gear design
CO5	CONSTRUCT cam profile for given follower motion
	Subject -Applied Thermodynamics **Subject Code-202048**
CO1	DETERMINE COP of refrigeration system and ANALYZE psychometric processes.
CO2	DISCUSS basics of engine terminology, air standard, fuel air and actual cycles.
CO3	IDENTIFY factors affecting the combustion performance of SI and CI engines
CO4	DETERMINE performance parameters of IC Engines and emission control.
CO5	EXPLAIN working of various IC Engine systems and use of alternative fuels
CO6	CALCULATE performance of single and multi-stage reciprocating compressors and DISCUSS rotary positive displacement compressors
	Subject - Fluid Mechanics **Subject Code-202049**
CO1	DETERMINE various properties of fluid
CO2	APPLY the laws of fluid statics and concepts of buoyancy
CO3	IDENTIFY types of fluid flow and terms associated in fluid kinematics
CO4	APPLY principles of fluid dynamics to laminar flow
CO5	ESTIMATE friction and minor losses in internal flows and DETERMINE boundary layer formation over an external surface

BACK

	Course Outcomes For Batch 2019-2023
CO6	CONSTRUCT mathematical correlation considering dimensionless parameters, also ABLE to predict the performance of prototype using model laws
	Subject - Manufacturing Processes **Subject Code-202050**
CO1	SELECT appropriate molding, core making and melting practice and estimate pouring time, solidification rate and DESIGN riser size and location for sand casting process
CO2	UNDERSTAND mechanism of metal forming techniques and CALCULATE load required for flat rolling
CO3	DEMONSTRATE press working operations and APPLY the basic principles to DESIGN dies and tools for forming and shearing operations
CO4	CLASSIFY and EXPLAIN different welding processes and EVALUATE welding characteristics
CO5	DIFFERENTIATE thermoplastics and thermosetting and EXPLAIN polymer processing techniques
CO6	UNDERSTAND the principle of manufacturing of fiber-reinforced composites and metal matrix composites
	Subject - Machine Shop **Subject Code-202051**
CO1	PERFORM welding using TIG/ MIG/ Resistance/Gas welding technique
CO2	MAKE Fibre-reinforced Composites by hand lay-up process or spray lay-up techniques
CO3	PERFORM cylindrical/surface grinding operation and CALCULATE its machining time
CO4	DETERMINE number of indexing movements required and acquire skills to PRODUCE a spur gear on a horizontal milling machine
CO5	PREPARE industry visit report
CO6	UNDERSTAND procedure of plastic processing
	Subject - Project Based Learning – II **Subject Code-202052**
CO1	IDENTIFY the real-world problem (possibly of interdisciplinary nature) through a rigorous literature survey and formulate / set relevant aims and objectives.
CO2	ANALYZE the results and arrive at valid conclusions.
CO3	PROPOSE a suitable solution based on the fundamentals of mechanical engineering by possibly integration of previously acquired knowledge.
CO4	CONTRIBUTE to society through proposed solutions by strictly following professional ethics and safety measures

Course Outcomes For Batch 2019-2023	
CO5	USE of technology in proposed work and demonstrate learning in oral and written form.
CO6	DEVELOP ability to work as an individual and as a team member.
	Subject -Audit Course IV Human Behaviour **Subject Code-202053**
CO1	Able to understand science of human behaviour through sensation and perception and effective learning
CO2	Able to understand importance of emotional control and intelligence in human behaviour
CO3	Able to understand importance of social behaviour and personality development
	T.E. 2021-22
	Semester-V
	Subject - Numerical & Statistical Methods **Subject Code-302041**
CO1	SOLVE system of equations using direct and iterative numerical methods.
CO2	ESTIMATE solutions for differential equations using numerical techniques.
CO3	DEVELOP solution for engineering applications with numerical integration.
CO4	DESIGN and CREATE a model using a curve fitting and regression analysis.
CO5	APPLY statistical Technique for quantitative data analysis.
CO6	DEMONSTRATE the data, using the concepts of probability and linear algebra
	Subject - Heat and Mass Transfer **Subject Code-302042**
CO1	ANALYZE &APPLY the modes of heat transfer equations for one dimensional thermal system.
CO2	DESIGN a thermal system considering fins, thermal insulation and & Transient heat conduction.
CO3	EVALUATE the heat transfer rate in natural and forced convection & validate with experimentation results.
CO4	INTERPRET heat transfer by radiation between objects with simple geometries, for black and gray surfaces.
CO5	ABILITY to analyze the rate of mass transfer using Fick's Law of Diffusion and understands mass diffusion in different coordinate systems.
CO6	DESIGN & ANALYSIS of heat transfer equipment and investigation of its performance.
	Subject - Design of Machine Elements **Subject Code-302043**

67

Course Outcomes For Batch 2019-2023	
CO1	DESIGN AND ANALYZE the cotter and knuckle Joints, levers and components subjected to eccentric loading.
CO2	DESIGN shafts, keys and couplings under static loading conditions.
CO3	ANALYZE different stresses in power screws and APPLY those in the procedure to design screw jack.
CO4	EVALUATE dimensions of machine components under fluctuating loads.
CO5	EVALUATE & INTERPRET the stress developed on the different type of welded and threaded joints.
CO6	APPLY the design and development procedure for different types of springs.
	Subject – Mechatronics **Subject Code-302044**
CO1	DEFINE key elements of mechatronics, principle of sensor and its characteristics.
CO2	UTILIZE concept of signal processing and MAKE use of interfacing systems such as ADC, DAC, Digital I/O.
CO3	DETERMINE the transfer function by using block diagram reduction technique.
CO4	EVALUATE Poles and Zero, frequency domain parameters for mathematical modeling for mechanical systems.
CO5	APPLY the concept of different controller modes to an industrial application.
CO6	DEVELOP the ladder programming for industrial application.
	Subject -ELECTIVE-I Machining Science & Technology **Subject Code-[302045-B]**
CO1	DEFINE metal cutting principles and mechanics of metal cutting and tool life, solidification rate and DESIGN riser size and location for sand casting process
CO2	DESCRIBE features of gear and thread manufacturing processes.
CO3	SELECT appropriate grinding wheel and demonstrate the various surface finishing processes
CO4	SELECT appropriate jigs/fixtures and to draw the process plan for a given component.
CO5	SELECT & EVALUATE various parameters of process planning
CO6	GENERATE CNC program for Turning / Milling processes and generate tool path using CAM software.
	Subject -Digital Manufacturing Laboratory **Subject Code-302046**
CO1	DEVELOP a component using conventional machines, CNC machines and Additive Manufacturing Techniques.

Course Outcomes For Batch 2019-2023	
CO2	ANALYZE cutting tool parameters for machining given job.
CO3	DEMONSTRATE simulation of manufacturing process using Digital Manufacturing Tools.
CO4	SELECT and DESIGN jigs and Fixtures for a given component.
CO5	DEMONSTRATE different parameters for CNC retrofitting and reconditioning.
	Subject - Skill Development **Subject Code-302047**
CO1	APPLY& DEMONSTRATE procedure of assembly & disassembly of various machines.
CO2	DESIGN & DEVELOP a working/model of machine parts or any new product.
CO3	EVALUATE fault with diagnosis on the machines, machine tools and home appliances.
CO4	IDENTIFY & DEMONSTRATE the various activities performed in an industry such as maintenance, design of components, material selection.
	Subject -Audit Course V: Management of inventory system **Subject Code-302048**
CO1	To understand the types of inventory used in industry
CO2	To understand the various techniques for inventory analysis.
CO3	To understand the various techniques for inventory management.
T.E 2021-22 SEMESTER-VI	
	Subject - Artificial Intelligence & Machine Learning **Subject Code-302049**
CO1	DEMONSTRATE fundamentals of artificial intelligence and machine learning.
CO2	APPLY features extraction and selection techniques.
CO3	APPLY machine learning algorithms for classification and regression problems.
CO4	DEVISE AND DEVELOP a machine learning model using various steps.
CO5	EXPLAIN concepts of reinforced and deep learning.
CO6	SIMULATE machine learning model in mechanical engineering problems.
	Subject - Computer Aided Engineering **Subject Code-302050**
CO1	DEFINE the use of CAE tools and DESCRIBE the significance of shape functions in finite element formulations.
CO2	APPLY the various meshing techniques for better evaluation of approximate results.
CO3	APPLY material properties and boundary condition to SOLVE 1-D and 2-D element stiffness matrices to obtain nodal or elemental solution.

BACK

Course Outcomes For Batch 2019-2023	
CO4	ANALYZE and APPLY various numerical methods for different types of analysis.
CO5	EVALUATE and SOLVE non-linear and dynamic analysis problems by analyzing the results obtained from analytical and computational methods.
CO6	GENERATE the results in the form of contour plot by the USE of CAE tools.
	Subject - Design of Transmission Systems **Subject Code-302051**
CO1	APPLY the principle of Spur & Helical gear design for industrial application and PREPARE a manufacturing drawing with the concepts of GD&T.
CO2	EXPLAIN and DESIGN Bevel & Worm gear considering design parameters as per design standards.
CO3	SELECT DESIGN Rolling and Sliding Contact Bearings from manufacturer's catalog for a typical application considering suitable design parameters.
CO4	DEFINE and DESIGN various types of Clutches, Brakes, used in automobiles.
CO5	APPLY various concept to DESIGN Machine Tool Gear box, for different applications
CO6	ELABORATE various modes of operation, degree of hybridization and allied terms associated with hybrid electric vehicles.
	Subject - ELECTIVE II **Subject Code-302052-A**
CO1	DEFINE & COMPARE composites with traditional materials.
CO2	IDENTIFY & ESTIMATE different parameters of the Polymer Matrix Composite
CO3	CATEGORIZE and APPLY Metal Matrix Process from possessions landscape.
CO4	DETERMINE volume/weight fraction and strength of Composites.
CO5	SELECT appropriate testing and inspection method for composite materials
CO6	SELECT composites materials for various applications.
	Subject - Measurement Laboratory **Subject Code-302053**
CO1	EVALUATE causes of errors in Vernier calipers, micrometers by performing experiments in standard meteorological conditions, noting deviations at actual and by plotting cause and effect diagram, to reduce uncertainty in measurement.
CO2	ANALYZE strain measurement parameters by taking modulus of elasticity in consideration to acknowledge its usage in failure detection and force variations.
CO3	EXAMINE surface Textures, surface finish using equipment like Talysurf and analyze surface finish requirements of meteorological equipment like gauges, jaws of Vernier

	Course Outcomes For Batch 2019-2023
	calipers, micrometers, magnifying glasses of height gauge and more, to optimize surface finish accuracy requirements and cost of measurement.
CO4	MEASURE the dimensional accuracy using Comparator and limit gauges and appraise their usage in actual measurement or comparison with standards set to reduce measurement lead time.
CO5	PERFORM Testing of Flow rate, speed and temperature measurements and their effect on performance in machines and mechanisms like hydraulic or pneumatic trainers, lathe machines etc. to increase repeatability and reproducibility.
CO6	COMPILE the information of opportunities of entrepreneurships/business in various sectors of metrology like calibrations, testing, coordinate and laser metrology etc in an industry visit report.
	Subject - Fluid Power & Control Laboratory **Subject Code-302054**
CO1	DEFINE working principle of components used in hydraulic and pneumatic systems
CO2	IDENTIFY & EXPLAIN various applications of hydraulic and pneumatic systems.
CO3	SELECT an appropriate component required for hydraulic and pneumatic systems using manufactures' catalogs.
CO4	SIMULATE & ANALYZE various hydraulic and pneumatic systems for industrial/mobile applications.
CO5	DESIGN a hydraulic and pneumatic system for industrial applications.
	Subject - Internship/Mini project **Subject Code-302055**
CO1	DEMONSTRATE professional competence through industry internship.
CO2	APPLY knowledge gained through internships to complete academic activities in a professional manner.
CO3	CHOOSE appropriate technology and tools to solve a given problem.
CO4	CO4. DEMONSTRATE abilities of a responsible professional and use ethical practices in day to day life.
CO5	DEVELOP network and social circle, and DEVELOPING relationships with industry people.
CO6	ANALYZE various career opportunities and DECIDE career goals.
	Subject -Audit Course VI: Management of information systems **Subject Code-302056**

71

Course Outcomes For Batch 2019-2023	
CO1	To understand the Definition of Management of information systems and Marketing information system
CO2	To understand the decision support system and Strategic uses of information technology.
CO3	To Understand the Computer Aided Planning (CAP) tools
	B.E. 2022-23
	Semester-VII
	Subject - Heating Ventilation Air-Conditioning and Refrigeration **Subject Code-402041**
CO1	ANALYZE different air-craft refrigeration systems and EXPLAIN the properties, applications and environmental issues of different refrigerants.
CO2	ANALYZE multi pressure refrigeration system used for refrigeration applications.
CO3	DISCUSS types of compressors, condensers, evaporators and expansion valves along with regulatory and safety controls and DESCRIBE Transcritical and ejector refrigeration systems.
CO4	ESTIMATE cooling load for air conditioning systems used with concern of design conditions and indoor quality of air
CO5	DESIGN air distribution system along with consideration of ventilation and infiltration
CO6	EXPLAIN the working of types of desiccants, evaporative, thermal storage, radiant cooling, clean room and heat pump systems
	Subject -Dynamics of Machinery **Subject Code-402042**
CO1	APPLY balancing technique for static and dynamic balancing of multi cylinder inline and radial engines
CO2	ANALYZE the gyroscopic couple or effect for stabilization of Ship, Airplane and Four wheeler vehicles
CO3	ESTIMATE natural frequency for single DOF un-damped & damped free vibratory systems
CO4	DETERMINE response to forced vibrations due to harmonic excitation, base excitation and excitation due to unbalance forces.
CO5	ESTIMATE natural frequencies, mode shapes for 2 DOF un-damped free longitudinal and torsional vibratory systems.
CO6	DESCRIBE noise and vibration measuring instruments for industrial / real life applications along with suitable methods for noise and vibration control.
	Subject - Turbomachinery **Subject Code-402043**

72

Course Outcomes For Batch 2019-2023	
CO1	VALIDATE impulse momentum principle using flat, inclined and curved surfaces and INVESTIGATE performance characteristics of hydraulic turbines.
CO2	DETERMINE performance parameters of impulse and reaction steam turbine along with discussion of nozzles, governing mechanism & losses
CO3	MEASURE performance parameters of single & multistage centrifugal pumps along with discussion of cavitation and selection.
CO4	EXPLAIN performance parameters of centrifugal compressor along with discussion of theoretical aspects of axial compressor.
	Subject - Elective – III Industrial Engineering **Subject Code-402044D**
CO1	To introduce the concepts, principles, and framework of Industrial Engineering and Productivity enhancement approaches.
CO2	To familiarize the students with different time study and work measurement techniques for productivity improvement.
CO3	To introduce various aspects of facility design.
CO4	To acquaint the students with various components and functions of Production Planning and Control.
CO5	To acquaint the student about inventory management and approaches to control.
CO6	To acquire the students with concepts of ergonomics, value engineering and job evaluation.
	Subject - Elective – IV Additive Manufacturing **Subject Code-402045C-**
CO1	USE and CLASSIFY the fundamentals of Additive Manufacturing Technologies for engineering applications.
CO2	IDENTIFY and CATEGORIZE the methodology to manufacture the products using light-based photo-curing, LASER based technologies and STUDY their applications, benefits.
CO3	IDENTIFY and CATEGORIZE the methodology to manufacture the products using extrusion-based deposition, inkjet-based technologies and STUDY their applications, benefits
CO4	SYNTHESIZE, RECOMMEND and DESIGN the suitable material and process for fabrication and build behavior of verities of product.
CO5	DESIGN and CONSTRUCT the AM equipment's for appropriate applications and the input CAD model.
CO6	DEVELOP the knowledge of additive manufacturing for various real-life applications.

	Course Outcomes For Batch 2019-2023	
	Subject - Data Analytics Laboratory **Subject Code-402046**	
CO1	UNDERSTAND the basics of data analytics using concepts of statistics and probability.	
CO2	APPLY various inferential statistical analysis techniques to describe data sets and withdraw useful conclusions from acquired data sets.	
CO3	EXPLORE the data analytics techniques using various tools	
CO4	APPLY data science concept and methods to solve problems in real world context	
CO5	SELECT advanced techniques to conduct thorough and insightful analysis and interpret the results	
	Subject - Project (Stage I) **Subject Code-402047**	
CO1	IMPLEMENT systems approach.	
CO2	CONCEPTUALIZE a novel idea / technique into a product	
CO3	THINK in terms of a multidisciplinary environment	
CO4	TAKE ON the challenges of teamwork, and DOCUMENT all aspects of design work.	
CO5	UNDERSTAND the management techniques of implementing a project.	
CO6	DEMONSTRATE the final product for Functionality, Designability, and Manufacturability	
	Subject -Audit Course VII: Subject-Stress Management **Code-402054 B**	
CO1	Understand the basic principles of stress management.	
CO2	Recognize your stress triggers and how to manage them.	
CO3	Develop proactive responses to stressful situations.	
	B.E. 2022-23 Semester-VIII	
	Subject -Computer Integrated Manufacturing **Subject Code-402048**	
CO1	EXPLAIN CIM and factory automation	
CO2	UNDERSTAND the integration of hardware and software elements for CIM	
CO3	APPLY CNC program for appropriate manufacturing techniques	
CO4	ANALYZE processes planning, quality and MRP integrated with computers	
CO5	INTERPRET flexible, cellular manufacturing and group technology.	
CO6	ANALYZE the effect of IOT, Industry-4.0 and cloud base manufacturing.	

BACK

74

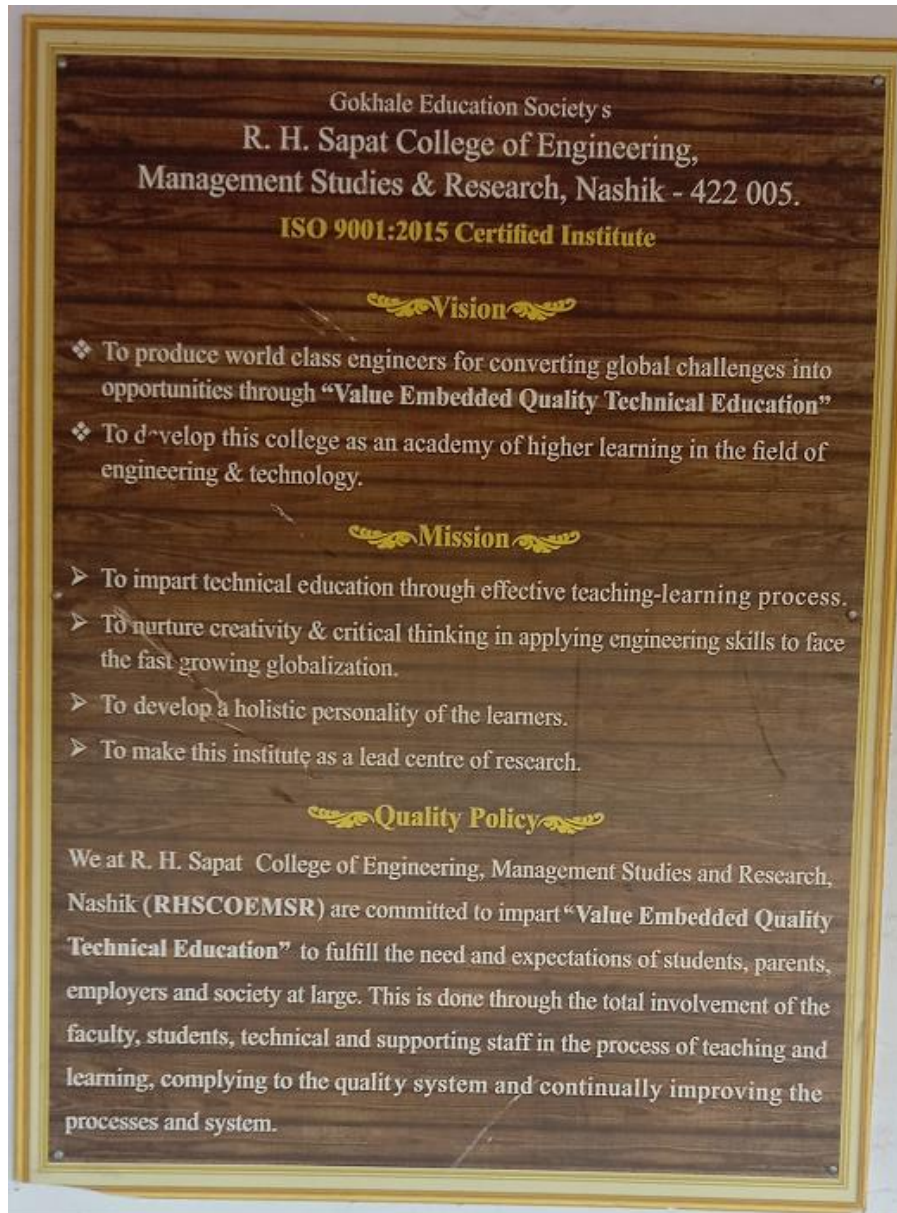| Course Outcomes For Batch 2019-2023	
	Subject -Energy Engineering **Subject Code-402049**
CO1	EXPLAIN the power generation scenario, the layout components of thermal power plants and ANALYZE the improved Rankine cycle.
CO2	ANALYZE the performance of steam condensers, cooling tower system; RECOGNIZE an environmental impact of energy systems and methods to control the same.
CO3	EXPLAIN the layout, component details of diesel engine plant, hydel and nuclear energy systems.
CO4	ANALYZE gas and improved power cycles.
CO5	EXPLAIN the fundamentals of renewable energy systems.
CO6	EXPLAIN basic principles of energy management, storage and economics of power generation.
	Subject - Quality and Reliability Engineering (Elective – V) **Subject Code-402051**
CO1	UNDERSTAND basic concepts of quality and RELATE various quality tools
CO2	DEVELOP analytical competencies to SOLVE problems on control charts and process capability
CO3	UNDERSTAND fundamental concepts of reliability.
CO4	EVALUATE system reliability
CO5	IDENTIFY various failure modes and CREATE fault tree diagram
CO6	UNDERSTAND the concept of reliability centered maintenance and APPLY reliability tests methods
	Subject - Industrial Psychology and Organizational Behavior (Elective – VI) **Subject Code-402051D**
CO1	To develop an understanding of the nature, functioning and design of organization as social collectivities.
CO2	To orient the students to the application of principles of psychology in an industrial and organizational workplace
CO3	To demonstrate the understanding of job requirement and related fatigue, boredom and ways to handle it.
CO4	To develop the insights into performance management and understanding related improvement strategies.
CO5	To have an understanding of human behavior in groups and develop knowledge and skills in leadership, power, communication, negotiation and conflict management.

BACK

75

Course Outcomes For Batch 2019-2023	
CO6	To develop the acumen to understand the organizational culture, change management and organizational development.
	Subject - Mechanical Systems Analysis Laboratory **Subject Code-402052**
CO1	DEVELOP an understanding of the Systems Engineering Process and the range of factors that influence the product need, problem-specific information collection, Problem Definition, Task Specification, Solution Concept inception, Concept Development, System's Mathematical Modelling, Synthesis, Analysis, final solution Selection, Simulation, Detailed Design, Construction, Prototyping, Testing, fault-finding, Diagnosis, Performance Analysis, and Evaluation, Maintenance, Modification, Validation, Planning, Production, Evaluation and use of a system using manual calculation, computational tools 108 | P a g e to automate product development process, redesign from customer feedback and control of technological systems.
CO2	ILLUSTRATE the concepts and USE the developed skill-set of use of computational tools (FEA, CFD, MBD, FSI, CAE) to automate the complete product development process
CO3	EVALUATE the knowledge of new developments and innovations in technological systems to carry forward to next stage of employment after passing your Undergraduate Degree Examination
CO4	APPRISE how technologies have transformed people's lives and can be used to SOLVE challenges associated with climate change, efficient energy use, security, health, education and transport, which will be coming your way in the coming future.
CO5	PRIORITIZE the concept of quality and standards, including systems reliability, safety and fitness for the intended purpose.
CO6	INVENT yourself to face the challenges of future technologies and their associated Problems.
	Subject - PROJECT STAGE II **Subject Code-402053**
CO1	IMPLEMENT systems approach.
CO2	CONCEPTUALIZE a novel idea / technique into a product
CO3	THINK in terms of a multidisciplinary environment
CO4	TAKE ON the challenges of teamwork, and DOCUMENT all aspects of design work.
CO5	UNDERSTAND the management techniques of implementing a project.
CO6	DEMONSTRATE the final product for Functionality, Designability, and Manufacturability

76

Course Outcomes For Batch 2019-2023	
	Subject -Audit Course VIII Subject- Operations Management **Code-402055B**
CO1	Understand the input–process–output framework, the extensions of it, and apply them to a wide range of operations
CO2	Examine the types of transformation processes occurring within operations
CO3	Define the roles and responsibilities of operations managers and the challenges they face

2. Display board outside departments for communicating vision, mission, POs, PEOs, PSOs.

Department of Mechanical Engineering

Gokhale Education Society's
**R H Sapat College of Engineering,
Management Studies And Research, Nashik**

DEPARTMENT OF MECHANICAL ENGINEERING

VISION

To impart quality education in Mechanical Engineering and develop students to be self-employed and to work in the industry and society.

MISSION

M1: To impart analytical and conceptual skills through adequate exposure to theory and practice.

M2: To impart basic and contemporary science, engineering and research skills for identifying problems and to be able to develop practical solutions to them.

M3: To inculcate social and professional ethical responsibility through value embedded technical knowledge.

Program Specific Outcomes (PSOs)-UG

- Mechanical Engineering Graduates will be able to work in the industries with the thorough knowledge in the field of thermal, design and manufacturing processes.
- Mechanical Engineering Graduates will be able to demonstrate the ability to identify, formulate and solve mechanical engineering problems using research based knowledge and research methods.
- Mechanical Engineering Graduates will be able to apply value embedded technical knowledge to assess social and professional ethical responsibility.

Gokhale Education Society's

R H Sapat College of Engineering, Management Studies And Research, Nashik

DEPARTMENT OF MECHANICAL ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

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

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

PO3 **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.

PO4 **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.

PO5 **Modern Tool usage :** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6 **The Engineer and Society :** Apply reasoning informed by the contextual knowledge to assess so cietal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 **Environment and Sustainability** : Understand the impact of the professional engineering solutions in societal and en vironmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

PO9 **Individual and Team Work :** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 **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.

PO11 **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 multidisciplinary environments.

PO12 **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.

Gokhale Education Society's

R H Sapat College of Engineering, Management Studies And Research, Nashik

DEPARTMENT OF MECHANICAL ENGINEERING

VISION

To impart quality education in Mechanical Engineering and develop students to be self-employed and to work in the industry and society.

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M2: To impart basic and contemporary science, engineering and research skills for identifying problems and to be able to develop practical solutions to them.

M3: To inculcate social and professional ethical responsibility through value embedded technical knowledge.

Program Specific Outcomes (PSOs) - PG

- Mechanical Engineering Graduates will be able to develop research attitude and multidisciplinary approach through demonstration of good analytical, design and implementation skills.
- Mechanical Engineering Graduates will be able to investigate and provide solution to problems in the field of design, optimization and vibration using relevant research methodology, techniques and tools.
- Mechanical Engineering Graduates will be able to apply the knowledge of engineering and management principles to work as a member/leader of multidisciplinary design team.

BACK

Department of Electrical Engineering

GES'S RHSCOE MS & R	
Course Outcome Batch 2019-23	
Course Code	**Course**
SEMESTER I	
FE 2019-20	
107001	**Engineering Mathematics-I**
CO101.1	Mean value theorems and its generalizations leading to Taylors and Maclaurin's series useful in the analysis of engineering problems.
CO101.2	The Fourier series representation and harmonic analysis for design and analysis of periodic continuous and discrete systems.
CO101.3	To deal with derivative of functions of several variables that are essential in various branches of Engineering.
CO101.4	To apply the concept of Jacobian to find partial derivative of implicit function and functional dependence. Use of partial derivatives in estimating error and approximation and finding extreme values of the function.
CO101.5	The essential tool of matrices and linear algebra in a comprehensive manner for analysis of system of linear equations, finding linear and orthogonal transformations, Eigen values and Eigen vectors applicable to engineering problems
107002	**Engineering Physics**
CO102.1	Develop understanding of interference, diffraction and polarization; connect it to few engineering applications.
CO102.2	Learn basics of lasers and optical fibers and their use in some applications.
CO102.3	Understand concepts and principles in quantum mechanics. Relate them to some applications.
CO102.4	Understand theory of semiconductors and their applications in some semiconductor devices.
CO102.5	Summarize basics of magnetism and superconductivity. Explore few of their technological applications.
CO102.6	Comprehend use of concepts of physics for Non Destructive Testing. Learn some properties of nano materials and their application.
102003	**Systems in Mechanical Engineering**
CO103.1	Describe and compare the conversion of energy from renewable and non-renewable energy sources
CO103.2	Explain basic laws of thermodynamics, heat transfer and their applications
CO103.3	List down the types of road vehicles and their specifications
CO103.4	Illustrate various basic parts and transmission system of a road vehicle
CO103.5	Discuss several manufacturing processes and identify the suitable process
CO103.6	Explain various types of mechanism and its application
103004	**Basic Electrical Engineering**
CO104.1	Differentiate between electrical and magnetic circuits and derive mathematical relation for self and mutual inductance along with coupling effect.
CO104.2	Calculate series, parallel and composite capacitor as well as characteristics parameters of alternating quantity and phasor arithmetic
CO104.3	Derive expression for impedance, current, power in series and parallel RLC circuit with AC supply along with phasor diagram.
CO104.4	Relate phase and line electrical quantities in polyphase networks,

	demonstrate the operation of single phase transformer and calculate efficiency and regulation at different loading conditions
CO104.5	Apply and analyze the resistive circuits using star-delta conversion KVL, KCL and different network theorems under DC supply
CO104.6	Evaluate work, power, and energy relations and suggest various batteries for different applications, concept of charging and discharging and depth of charge.
110005	**Programming and Problem Solving**
CO105.1	Inculcate and apply various skills in problem solving
CO105.2	Choose most appropriate programming constructs and features to solve the problems in diversified domains
CO105.3	Exhibit the programming skills for the problems those require the writing of well documented programs including use of the logical constructs of language, Python.
CO105.4	Demonstrate significant experience with the Python program development environment.
111006	**Workshop Practice**
CO106.1	Familiar with safety norms to prevent any mishap in workshop.
CO106.2	Able to handle appropriate hand tool, cutting tool and machine tools to manufacture a job.
CO106.3	Able to understand the construction, working and functions of machine tools and their parts.
CO106.4	Able to know simple operations (Turning and Facing) on a centre lathe.
101007	**Environmental Studies-I**
CO107.1	Demonstrate an integrative approach to environmental issues with a focus on sustainability.
CO107.2	Explain and identify the role of the organism in energy transfers in different ecosystems.
CO107.3	Distinguish between and provide examples of renewable and nonrenewable resources & analyze personal consumption of resources.
CO107.4	Identify key threats to biodiversity and develop appropriate policy options for conserving biodiversity in different settings.
SEMESTER II	
FE 2019-20	
107008	**Engineering Mathematics – II**
CO108.1	The effective mathematical tools for solutions of first order differential equations that model physical processes such as Newton's law of cooling, electrical circuit, rectilinear motion, mass spring systems, heat transfer etc
CO108.2	Advanced integration techniques such as Reduction formulae, Beta functions, Gamma functions, Differentiation under integral sign and Error functions needed in evaluating multiple integrals and their applications.
CO108.3	To trace the curve for a given equation and measure arc length of various curves.
CO108.4	The concepts of solid geometry using equations of sphere, cone and cylinder in a comprehensive manner.
CO108.5	Evaluation of multiple integrals and its application to find area bounded by curves, volume bounded by surfaces, Centre of gravity and Moment of inertia.

BACK

107009	**Engineering Chemistry**
CO109.1	Apply the different methodologies for analysis of water and techniques involved in softening of water as commodity.
CO109.2	Select appropriate electro-technique and method of material analysis.
CO109.3	Demonstrate the knowledge of advanced engineering materials for various engineering applications.
CO109.4	Analyze fuel and suggest use of alternative fuels.
CO109.5	Identify chemical compounds based on their structure.
CO109.6	Explain causes of corrosion and methods for minimizing corrosion.
104010	**Basic Electronics Engineering**
CO110.1	Explain the working of P-N junction diode and its circuits.
CO110.2	Identify types of diodes and plot their characteristics and also can compare BJT with MOSFET.
CO110.3	Build and test analog circuits using OPAMP and digital circuits using universal/basic gates and flip flops
CO110.4	Use different electronics measuring instruments to measure various electrical parameters.
CO110.5	Select sensors for specific applications.
101011	**Engineering Mechanics**
CO111.1	Determine resultant of various force systems
CO111.2	Determine centroid, moment of inertia and solve problems related to friction
CO111.3	Determine reactions of beams, calculate forces in cables using principles of equilibrium
CO111.4	Solve trusses, frames for finding member forces and apply principles of equilibrium to forces in space
CO111.5	Calculate position, velocity and acceleration of particle using principles of kinematics
CO111.6	Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy
102012	**Engineering Graphics**
CO112.1	Draw the fundamental engineering objects using basic rules and able to construct the simple geometries.
CO112.2	Construct the various engineering curves using the drawing instruments.
CO112.3	Apply the concept of orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object.
CO112.4	Apply the visualization skill to draw a simple isometric projection from given orthographic views precisely using drawing equipment.
CO112.5	Draw the development of lateral surfaces for cut section of geometrical solids.
CO112.6	Draw fully-dimensioned 2D, 3D drawings using computer aided drafting tools.
110013	**Project Based Learning**
CO113.1	Project based learning will increase their capacity and learning through shared cognition.
CO113.2	Students able to draw on lessons from several disciplines and apply them in practical way.
CO113.3	Learning by doing approach in PBL will promote long-term retention of

BACK

84

	material and replicable skill, as well as improve teachers' and students' attitudes towards learning.
101014	**Environmental Studies-II**
CO114.1	Have an understanding of environmental pollution and the science behind those problems and potential solutions.
CO114.2	Have knowledge of various acts and laws and will be able to identify the industries that are violating these rules.
CO114.3	Assess the impact of ever increasing human population on the biosphere: social, economic issues and role of humans in conservation of natural resources.
CO114.4	Learn skills required to research and analyze environmental issues scientifically and learn how to use those skills in applied situations such as careers that may involve environmental problems and/or issues
SEMESTER III	
SE 2020-21	
207006	**Engineering Mathematics-III**
CO201.1	Solve higher order linear differential equation using appropriate techniques to model and analyze electrical circuits.
CO201.2	Apply Integral transforms such as Laplace transform and special functions to solve problems related to electrical engineering applications.
CO201.3	Apply Integral transforms such as Fourier transform and Z-Transform to solve problems related to signal processing and control systems.
CO201.4	Apply Statistical methods like correlation, regression and Probability theory as applicable to analyze and interpret experimental data related to energy management, power systems, testing and quality control.
CO201.5	Perform Vector differentiation and integration, analyze the vector fields and apply to wave theory and electro-magnetic fields.
CO201.6	Analyze Complex functions, conformal mappings, and perform contour integration in the study of electrostatics, signal and image processing.
203141	**Power Generation Technologies**
CO202.1	Identify operations of thermal power plant with all accessories and cycles.
CO202.2	Be aware of the principle of operation, components, layout, location, environmental and social issues of nuclear, diesel and gas power plant.
CO202.3	Identify and demonstrate the components of hydro power plant and calculation of turbine required based on catchment area.
CO202.4	Find the importance of wind based energy generation along with its design, analysis and comparison
CO202.5	Apply solar energy in thermal and electrical power generation considering energy crisis, environmental and social benefits.
CO202.6	Understand the operation of electrical energy generation using biomass, tidal, geothermal, hydel plants, fuel cell and interconnection with grid.
203142	**Material Science**
CO203.1	Discuss classification, properties and characteristics of different electrical engineering materials.
CO203.2	State various applications measuring methods for parameters of different classes of electrical engineering materials.
CO203.3	Solve simple problems based on dielectric, magnetic and conducting materials.

BACK

CO203.4	Apply knowledge of Nano-technology to electrical engineering.
CO203.5	Execute tests on dielectric, insulating, magnetic, conducting, resistive materials as per IS to decide the quality of the materials.
CO203.6	Create learning resource material ethically to demonstrate self learning leading to lifelong learning skills and usage of ICT/ online technology through collaborative/active learning activities.
203143	**Analog and Digital Electronics**
CO204.1	Apply Boolean Algebra and De-morgan theory for logical circuit reduction
CO204.2	Design logical sequential and combinational digital circuits using K-Map.
CO204.3	Demonstrate different digital memories and programmable logic families
CO204.4	Apply and analyze applications of op-amp in open and close loop applications
CO204.5	Analyze and Design various other analog circuits like Timer, Regulators.
CO204.6	Design uncontrolled rectifier with given specification.
203144	**Electrical Measurements and Instrumentation**
CO205.1	Understand various characteristics of measuring instruments, their classification and range extension technique
CO205.2	Classify resistance, apply measurement techniques for measurement of resistance, inductance.
CO205.3	Explain construction, working principle and use of dynamometer type wattmeter for measurement of power under balance and unbalance condition.
CO205.4	Explain Construction, working principle of 1-phase and 3-phase induction static energy meter and calibration and procedures.
CO205.5	Use of CRO for measurement of various electrical parameters, importance of transducers, their classification, selection criterion and various applications
CO205.6	Measurement of various physical parameters using transducers, advanced metering and modeling.
203150	**Applications of Mathematics In Electrical Engineering**
CO206.1	Apply fundamentals of mathematics in solving electrical engineering problem
CO206.2	Analyze complex electrical engineering problem using mathematical techniques.
CO206.3	Implement program and simulation for problems in electrical engineering.
CO206.4	Demonstrate self lifelong learning skills with applications of mathematics in electrical engineering through software.
203151	**Soft Skill**
CO207.1	Do SWOT analysis.
CO207.2	Develop presentation and take part in group discussion.
CO207.3	Understand and implement etiquette in workplace and in society at large.
CO207.4	Work in team with team spirit.
CO207.5	Utilize the techniques for time management and stress management.
203152	**Audit Course-III**
CO208.1	Differentiate between types of solar Concentrators
CO208.2	Apply software tool for solar concentrators
CO208.3	Design different types of Solar collectors and balance of plant

BACK

SEMESTER IV	
SE 2020-21	
203145	**Power System I**
CO209.1	Recognize different patterns of load curve and calculate associated different factors with it and tariff.
CO209.2	Draft the specifications of electrical equipments in power station.
CO209.3	Design electrical and mechanical aspects in overhead transmission and underground cables.
CO209.4	Evaluate the inductance and capacitance of different transmission line configurations.
CO209.5	Analyze the performance of short and medium transmission lines.
203146	**Electrical Machines I**
CO210.1	To understand the Principal & Construction of 1 phase transformer to find regulation, efficiency and equivalent circuit parameter
CO210.2	Ability to understand different necessary conditions for parallel operation & load sharing for 1 phase & 3 Phase Transformer
CO210.3	To understand the principal & construction of DC machine to find power flow
CO210.4	To understand the DC machine application & It's testing.
CO210.5	To understand the performance characteristics of Induction Motor effect of rotor resistance, slip, flux, frequency on torque slip characteristics.
CO210.6	To understand performance characteristics of Induction motor using generalized mathematical modeling & circle diagram
203147	**Network Analysis**
CO211.1	Calculate current/voltage in electrical circuits using simplification techniques, Mesh, Nodal analysis.
CO211.2	Calculate current/voltage in electrical circuits using network theorems.
CO211.3	Analyze the response of RL, RC, RLC circuit with electrical supply in transient and stead state.
CO211.4	Apply Laplace transform to analyze behaviour of an electrical circuit.
CO211.5	Derive formula and solve numerical of two port network and Design of filters
CO211.6	Apply knowledge of network theory to find transfer function, poles and zeroes location to perform stability analysis and parallel resonance
203148	**Numerical Methods and Computer Programming**
CO212.1	Demonstrate types of errors in computation and their causes of occurrence.
CO212.2	Calculate root of algebraic and transcendental equations using various methods.
CO212.3	Apply numerical methods for various mathematical problems such as interpolation and Curve Fitting
CO212.4	Apply numerical methods for various mathematical problems such as integration and differentiation
CO212.5	Solve linear simultaneous equation using direct and indirect method.
CO212.6	Apply numerical methods to solve Ordinary Differential Equations
203149	**Fundamentals of Microcontroller and Applications**
CO213.1	Describe the architecture and features of various types of the microcontroller.
CO213.2	Illustrate addressing modes and execute programs in assembly language for the microcontroller.

CO213.3	Write programs in C language for microcontroller 8051.
CO213.4	Elaborate interrupt structure of 8051 and program to handle interrupt and ADC809
CO213.5	Define the protocol for serial communication and understand the microcontroller development systems.
CO213.6	Interface input output devices and measure electrical parameters with 8051 in real time
203152	**Project Based Learning**
CO214.1	Identify, formulate, and analyze the simple project problem.
CO214.2	Apply knowledge of mathematics, basic sciences, and electrical engineering fundamentals to develop solutions for the project.
CO214.3	Learn to work in teams, and to plan and carry out different tasks that are required during a project.
CO214.4	Understand their own and their team-mate's strengths and skills.
CO214.5	Draw information from a variety of sources and be able to filter and summarize the relevant points.
CO214.6	Communicate to different audiences in oral, visual, and written forms.
203153	**Audit Course-IV**
CO215.1	Design of Solar PV System for small & large Installations
CO215.2	Handle software tools for Solar PV Systems
SEMESTER V	
TE 2021-22	
303141	**Industrial and Technology Management**
CO301.1	Differentiate between different types of business organizations and discuss the fundamentals of economics and management.
CO301.2	Explain the importance of technology management and quality management.
CO301.3	Explain the importance of IPR and role of Human Resource Management.
CO301.4	Understand the importance of Quality and its significance.
CO301.5	Describe the characteristics of marketing & its types and overview of financial Management.
CO301.6	Discuss the qualities of a good leader and road map to Entrepreneurship.
303142	**Power Electronics**
CO302.1	Develop characteristics of different power electronic switching devices
CO302.2	Reproduce working principle of power electronic converters for different types of loads
CO302.3	Choose the appropriate converter for different applications
CO302.4	Learn about different types of inverters
CO302.5	Learn about different types of PWM techniques
CO302.6	learn about different types of Multi level inverters
303143	**Electrical Machines-II**
CO303.1	Learn construction and working principle of three phase Synchronous Machines.
CO303.2	Understand characteristics of three phase Synchronous Machines.
CO303.3	Learn construction of A.C. Series Motor and Special Purpose Motors.
CO303.4	Understand characteristics of A.C. Series Motor, induction motors and Special Purpose Motors.
CO303.5	Select the above machines in Power System, industrial, household & Military Engineering applications.

CO303.6	Testing of machines to evaluate the performance through experimentation.
303144	**Electrical Installation Design and Condition Based Maintenance**
CO304.1	Classify different types of distribution supply system and determine economics of distribution system. compare and classify various substations, bus-bars and Earthing systems.
CO304.2	Demonstrate the importance and necessity of maintenance.
CO304.3	Analyse and test different condition monitoring methods.
CO304.4	Carry out estimation and costing of internal wiring for residential and commercial installations.
CO304.5	Apply electrical safety procedures.
303145	**Elective-I Advanced Microcontroller and Embedded systems**
CO305.1	Explain architecture of PIC 18F458 microcontroller, its instructions and the addressing mode
CO305.2	Use Ports and timers for peripheral interfacing and delay generation
CO305.3	Interface special and generate events using CCP module
CO305.4	Effectively use interrupt structure in internal and External interrupt mod
CO305.5	Effectively use ADC for parameter measurement and also understand LCD interfacing
CO305.6	Use Serial Communication and various serial communication protocols
303146	**Seminar**
CO306.1	Relate with the current technologies and innovations in Electrical engineering.
CO306.2	Improve presentation and documentation skill
CO306.3	Apply theoretical knowledge to actual industrial applications and research activity.
CO306.4	Communicate effectively.
303147	**Audit course-V**
CO307.1	Explain and differentiate various types of energy storage for suitable applications
CO307.2	Understand battery recycling techniques
SEMESTER VI	
TE 2021-22	
303148	**Power System II**
CO308.1	Solve problems involving modeling. design and performance evaluation of HVDC and EHVAC power transmission lines.
CO308.2	Calculate per unit values and develop Y bus for solution power flow equations in power transmission networks.
CO308.3	Calculate current and voltages in a faulted power system under both symmetrical and asymmetrical faults and relate fault currents to circuit breaker rating.
303149	**Computer Aided Design of Electrical Machines**
CO309.1	Summarize temperature rise, methods of cooling of transformer and consider IS 2026 in transformer design.
CO309.2	Design the overall dimensions of the transformer.
CO309.3	Analyze the performance parameters of transformer
CO309.4	Design overall dimensions of three phase Induction motor
CO309.5	Analyze the performance parameters of three phase Induction motor
CO309.6	Implement and develop computer aided design of transformer and induction

BACK

	motor
303150	**Control System Engineering**
CO310.1	Construct mathematical model of Electrical and Mechanical system using differential equations and transfer function and develop analogy between Electrical and Mechanical systems.
CO310.2	Determine time response of systems for a given input and perform analysis of first and second order systems using time domain specifications.
CO310.3	Investigate closed loop stability of system in s-plane using Routh Hurwitz stability criteria and root locus.
CO310.4	Analyze the systems in frequency domain and investigate stability using Nyquist plot and Bode plot
CO310.5	Design PID controller for a given plant to meet desired time domain specifications.
303151	**IoT and Its Applications in Electrical Engineering**
CO311.1	Build circuits for signal acquisition and conditioning
CO311.2	Experiment with sensors and actuators and choose the right sensor for application
CO311.3	Determine the performance of IoT based automated process
CO311.4	Design and develop IoT based applications
303152	**Internship**
CO312.1	Understand the working culture and environment of the Industry and get familiar with various departments and practices in the industry.
CO312.2	Operate various meters, measuring instruments, tools used in industry efficiently and develop technical competence.
CO312.3	Apply internship learning in other course completions and final year project management, i.e. topic finalization, project planning, hardware development, result interpretations, report writing, etc
CO312.4	Create a professional network and learn about ethical, safety measures, and legal practices.
CO312.5	Appreciate the responsibility of a professional towards society and the environment.
CO312.6	Identify career goals and personal aspirations.
303153	**Audit Course VI-Project Management**
CO313.1	Elaborate importance of project management and its process.
CO313.2	Learn about the role of high performance teams and leadership in project management.
SEMESTER VII	
BE 2022-23	
403141	**Power System Operation & Control**
CO401.1	Summarize angle, voltage and frequency stability in the power system control (UN).
CO401.2	Illustrate various ways of interchange of power between interconnected utilities (AP).
CO401.3	Analyze stability and optimal load dispatch using different techniques (AN).
CO401.4	Select appropriate FACTS devices for stable operation of the system (EV).
CO401.5	Evaluate the stability of the system and suggest the methods to improve it (EV).

BACK

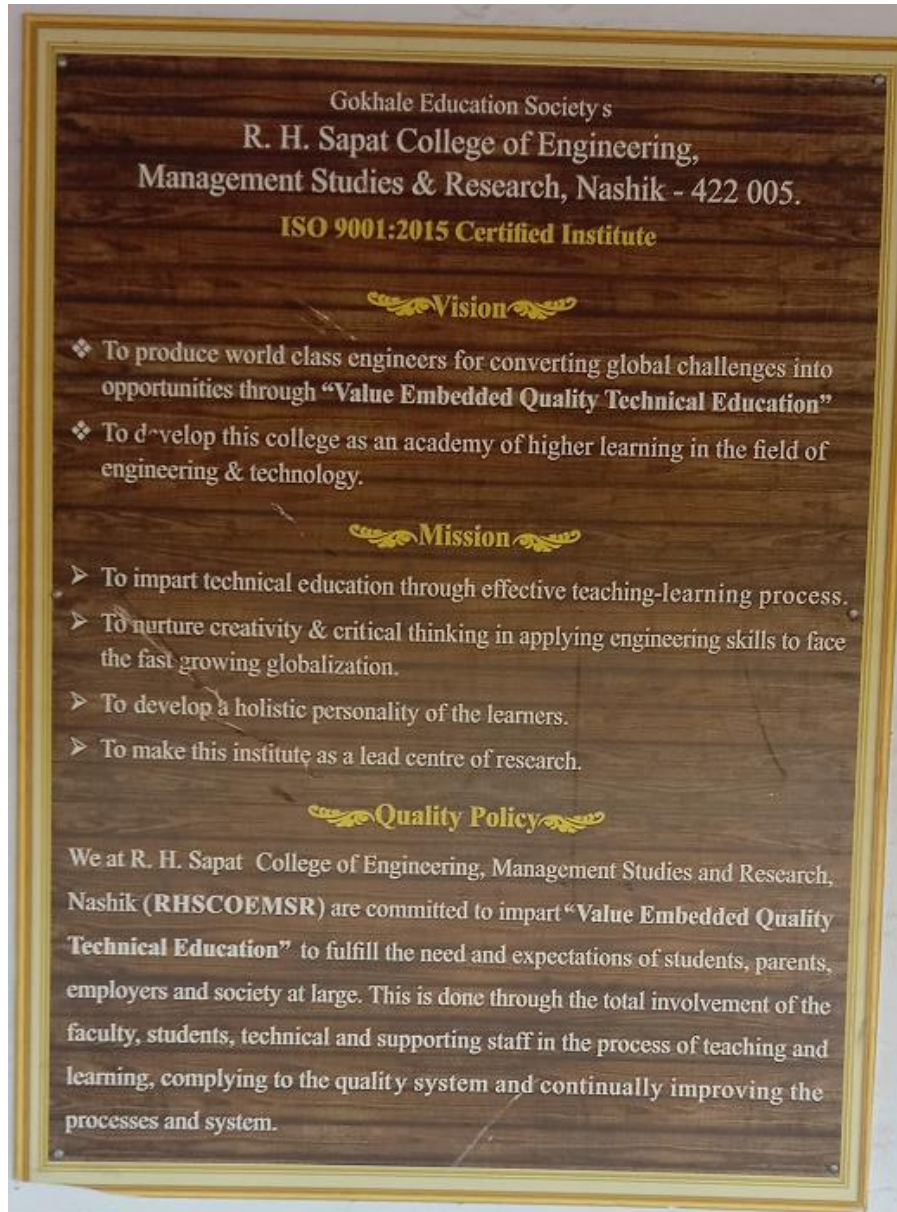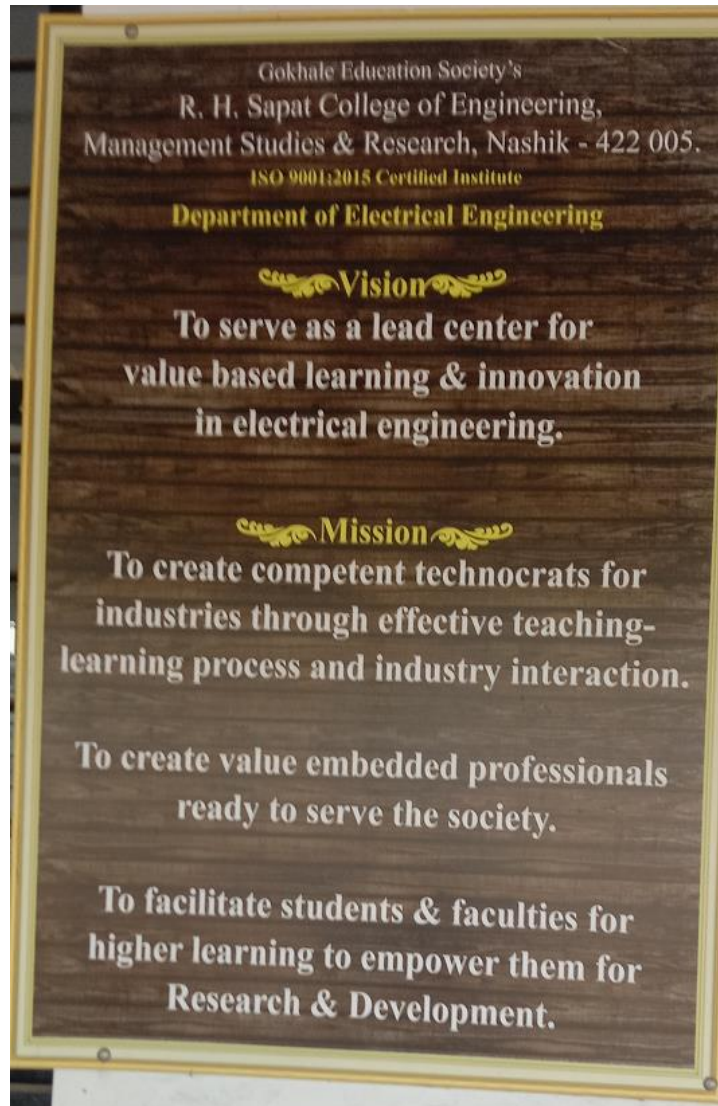| 403142	**Advanced Control System**
CO402.1	Explain compensation networks, common nonlinearities, the concept of state, sampling and reconstruction, and concepts of advanced controls (Understanding)
CO402.2	Determine transfer function from state model (Applying)
CO402.3	Test controllability and observability properties of the system (Evaluating)
CO402.4	Design compensators, state feedback controls, and observers for the system (Creating)
403143	**Elective-I HVE**
CO403A.1	Students will able to Reproduce concepts in breadth with various concepts of breakdown phenomenon of gaseous materials.
CO403A.2	Students will able to Reproduce concepts in breadth with various concepts of breakdown phenomenon of solid& liquid Dielectric.
CO403A.3	Students will able to Lightning & Switching surges & various causes of overvoltage and protection from them.
CO403A.4	List and reproduce various methods of generation of DC, AC and impulse high voltage.
CO403A.5	List and reproduce various methods of measurement of DC, AC and impulse high voltage.
CO403A.6	Apply safety measures, earthing, shielding for layout of HV apparatus required in High voltage laboratory.
403143	**Elective-I PLC & SCADA**
CO403B.1	Develop and explain the working of a PLC with the help of a block diagram.
CO403B.2	Classify input and output interfacing devices with PLC
CO403B.3	Design PLC based application by proper selection criteria, developing GUI and ladder program.
CO403B.4	Execute, debug, and test the programs developed for digital and analog operations.
CO403B.5	Develop the architecture of SCADA and explain the importance of SCADA in critical infrastructure.
CO403B.6	Describe the SCADA protocols and digital control systems, along with their architecture for automation.
403144	**Elective-II EHV**
CO403C.1	Analyze the Life Cycle Assessment of Li-ion battery.
CO403C.2	Describe the different types of Li-ion charging methods
CO403C.3	Comprehend the knowledge of drive train hybridization.
CO403C.4	Evaluate EV motor sizing.
CO403C.5	Classify Battery Recycling methods.
403145	**Project Stage-I**
CO404.1	Define the project problem statement and identify the scope of the project.
CO404.2	Search the appropriate research papers, standards and e-resources and write a literature survey.
CO404.3	Identify tools, techniques, methods, concepts, measuring devices, and instruments required for the project to define the methodology of the project.
CO404.4	Justify the selection of electrical, electronic and mechanical components for the project prototyping
CO404.5	Simulate or develop a system for software or hardware verification.
CO404.6	Write a project report with proper interpretation of results.

BACK

403146	MOOCs
CO405.1	Enables the students to directly engage and learn from the best faculty in the country in order to strengthen the fundamentals.
CO405.2	Explore new areas of interest in a relevant field.
CO405.3	Enable self learning initiative in learners.
CO405.4	Develop critical thinking to solve complex problems in engineering, science and humanities.
CO405.5	Improve communication skills by interacting with peers and course teachers.
403147	**Audit Course-VII**
CO406.1	Understand different types of environmental pollution problem.
CO406.2	Suggest solutions for sustainable development.
CO406.3	Develop a broader perspective in thinking for sustainable practices by utilizing engineering principle
SEMESTER VIII	
BE 2022-23	
403148	**Switchgear and Protection**
CO407.1	Understand the fundamentals of protective relaying.
CO407.2	Demonstrate the arc interruption and analyze the RRRV in circuit breakers
CO407.3	Demonstrate the construction and working principle of air brake circuit breakers, SF6 circuit breakers, and a vacuum circuit breaker.
CO407.4	Explain the characteristics of static and digital relays and their applications in power systems
CO407.5	Apply the differential protection scheme to large transformers, alternators, and induction motors
CO407.6	Apply distance protection, three stepped protection for transmission line.
403149	**Advanced Electrical Drives & Control**
CO408.1	Explain motor load dynamics and multi quadrant operation of drives.
CO408.2	Analyze operation of converter fed and chopper fed DC drives. C
CO408.3	Apply different braking methods of D.C. and induction motor drive.
CO408.4	Elaborate vector control for induction motor and BLDC drives.
CO408.5	Elaborate synchronous motor, reluctance motor drive.
CO408.6	Differentiate between classes and duty cycles of motors and select suitable drives in various industrial applications.
403150	**Elective-III Smart Grid**
CO409D.1	Apply the knowledge to differentiate between Conventional and Smart Grid
CO409D.2	Describe importance of Super capacitors.
CO409D.3	Identify the need of Smart metering.
CO409D.4	Apply the communication technology in smart grid.
CO409D.5	Comprehend the issues of micro grid.
403151	**Elective-IV**
CO409E.1	Define and reproduce various terms in illumination.
CO409E.2	Identify various parameters for illumination system design.
CO409E.3	Design indoor and outdoor lighting systems.
CO409E.4	Enlist state of the art illumination systems.
403152	**Project stage II**
CO410.1	Identify tools, techniques, methods, concepts, measuring devices, and instruments required for the project to define the methodology of the project

CO410.2	Justify the selection of electrical, electronic and mechanical components for the project prototyping
CO410.3	Select the appropriate testing method for system performance evaluation
CO410.4	Interpret results obtained by simulation, and hardware implementation and decide on further action or write a conclusion
CO410.5	Write a project report and research paper on the project work
403153	**Audit course VIII**
CO411.1	Design green and sustainable techniques for both commercial and residential buildings.
CO411.2	Design water, lighting, energy efficiency plan using renewable energy sources.
CO411.3	Explain the principles of building planning, its bylaws and provide facilities for rainwater harvesting
CO411.4	Understand the concepts of green buildings

BACK

2. Display board outside departments for communicating vision, mission, POs, PEOs, PSOs.

Department of Electrical Engineering

Gokhale Education Society's
R. H. Sapat College of Engineering,
Management Studies & Research, Nashik - 422 005.
ISO 9001:2015 Certified Institute

Vision

❖ To produce world class engineers for converting global challenges into opportunities through **"Value Embedded Quality Technical Education"**

❖ To develop this college as an academy of higher learning in the field of engineering & technology.

Mission

➢ To impart technical education through effective teaching-learning process.

➢ To nurture creativity & critical thinking in applying engineering skills to face the fast growing globalization.

➢ To develop a holistic personality of the learners.

➢ To make this institute as a lead centre of research.

Quality Policy

We at R. H. Sapat College of Engineering, Management Studies and Research, Nashik (**RHSCOEMSR**) are committed to impart **"Value Embedded Quality Technical Education"** to fulfill the need and expectations of students, parents, employers and society at large. This is done through the total involvement of the faculty, students, technical and supporting staff in the process of teaching and learning, complying to the quality system and continually improving the processes and system.

Gokhale Education Society's
R H Sapat College of Engineering, Management Studies And Research, Nashik

Department of Electrical Engineering

Program Educational Objectives
❖ To impart engineering knowledge through literature and hand's on practice.
❖ To create researchers and academic professional in field of electrical engineering.
❖ To generate industrial and social work ethics.

Program Outcomes
❖ **Engineering knowledge** : Apply the knowledge of mathematics, science, engineering fundamentals , and an engineering specialization to the solution of complex engineering problems.
❖ **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions, using first principles of mathematics, natural sciences, and engineering science.
❖ **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.
❖ **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.
❖ **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.
❖ **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.
❖ **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.
❖ **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
❖ **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
❖ **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.
❖ **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 multidisciplinary environments.
❖ **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

Program specific outcomes (Under graduate program)
❖ Be able to design, develop & take up research with eco-friendly innovative solution to electrical engineering problem.
❖ To possess the hardware, software and operational skills required to work in the electrical Industry.

Program specific outcomes (Post graduate program)
❖ Apply specialized knowledge to solve industry problems related to power electronics and drives using modern tools.
❖ Apply domain knowledge to analyze and design power electronics components, circuits and systems.

1.   Webpage on institute website with statements of Programme Outcomes (POs) and Course Outcomes (COs)

Course Outcome Batch 2020-2022
FYMCA(A.Y.-2020-2021)
MCA(Under faculty of Science and Technology)Semester-I 2020 Pattern
310901 Discrete Mathematics and Statistics

Course O. Code	Course Outcome
C310901.1	Solve real world problems logically by using set and induction approaches.
C310901.2	Describe and implement relations and functions.
C310901.3	Apply logical reasoning to solve a variety of problems
C310901.4	Apply statistical concepts to solve basic problems.
C310901.5	Solve the problems of Discrete Distributions and Continuous Distributions.
C310901.6	Explain various Descriptive Statistical concepts

310902 Data Structures and Algorithms

Course O. Code	Course Outcome
C310902.1	Explain the Complexity of Algorithms & fundamentals of Data Structures.
C310902.2	Describe representation & application of Linked List
C310902.3	Write programs that uses stacks, queues.
C310902.4	Apply nonlinear data structure trees to solve mathematical problems.
C310902.5	Explain representations & the applications of graphs.
C310902.6	Implement different searching and sorting algorithms.

310903 Object Oriented Programming

Course O. Code	Course Outcome
C310903.1	Explore the basics of OOP
C310903.2	Analyze the strengths of object oriented programming
C310903.3	Design and apply OOP principles for effective programming
C310903.4	Develop programming application using object oriented programming language C++
C310903.5	Achieve applicability of OOP
C310903.6	Precept the utility of OOP for advanced programming

310904 Software Engineering & Project Management

Course O. Code	Course Outcome
C310904.1	Choose and apply appropriate lifecycle model of software development
C310904.2	Analyze software requirements by applying various modelling techniques
C310904.3	Describe principles of agile development, discuss the SCRUM process and distinguish Agile process model from other process models
C310904.4	Describe project schedule and cost estimation
C310904.5	Understand IT project management through life cycle of the project and future trends in IT Project Management.
C310904.6	Define ethics and understand its importance in project leadership.

310905 Information Systems and Engineering Economics

Course O. Code	Course Outcome
C310905.1	Understand the need, usage and importance Management Functions, Organizational structure and Information Systems
C310905.2	Understand the Information Systems, Project Management, Managing Data resources, Knowledge Management, Business Process Integration and Enterprise Systems.

C310905.3	Understand the Management Information Systems Applications using in an Organization.
C310905.4	Elaborate Managerial Decision Making Models and applying to Business Intelligence.
C310905.5	Implement the basic Accounting concepts in the banking and financial applications
C310905.6	Apply the basic concepts of cost accounting in real world problem

310906: Data Structures and Algorithms Laboratory

Course O. Code	Course Outcome
C310906.1	Implement elementary data structures such as Arrays, linked lists
C310906.2	Implement representation & application of Linked List
C310906.3	Demonstrate practical knowledge on the applications of stacks, queues
C310906.4	Implement nonlinear data structure trees to solve mathematical problems.
C310906.5	Implement representations & the applications of graphs.
C310906.6	Implement different searching and sorting algorithms.

310907: Object Oriented Programming Laboratory

Course O. Code	Course Outcome
C310907.1	Understand and apply the concepts like Constructors, inheritance, polymorphism, destructor.
C310907.2	Understand and implement the concept like Array, String and operations on it.
C310907.3	Implement and analyzed the concepts of operators , friend function, this pointer.
C310907.4	Understand and apply the concepts like Virtual Functions.
C310907.5	Understand and apply the concepts of templates and exception handling.
C310907.6	Analyze the concept of file and apply it while storing and retrieving the data from secondary storage.

310908: Python Programming Laboratory

Course O. Code	Course Outcome
C310908.1	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.
C310908.2	Express proficiency in the handling of strings and functions.
C310908.3	Articulate the Object-Oriented Programming concepts using Python
C310908.4	Create Python programs by utilizing the data structures like lists,dictionaries, tuples and sets.
C310908.5	Design program using string manipulation functions.
C310908.6	Implement OOP's concept in Python.

310909: Business Communication Lab

Course O. Code	Course Outcome
C310909.1	Apply business communication strategies and principles to prepare effective communication for domestic and international business situations
C310909.2	Identify ethical, legal, cultural, and global issues affecting business communication.
C310909.3	Utilize analytical and problem solving skills appropriate to business communication.
C310909.4	Participate in team activities using collaborative work skills.
C310909.5	Select appropriate organizational formats and channels used in developing and presenting business messages.
C310909.6	Communicate via electronic mail, Internet, and other technologies.
C310909.7	Deliver an effective oral business presentation

310910 Audit Course 1 Road Safety

Course O. Code	Course Outcome
C310910.1	Student can able to understand Existing Road Transport Scenario
C310910.2	Student can able to understand Accident Causes & Remedies
C310910.3	Student can able to understand Road Accident Investigation & Investigation Methods
C310910.4	Student can able to understand Regulatory / Legislative Provisions for Improving Road Safety
C310910.5	Student can able to understand Behavioral Training for Drivers for Improving Road Safety

Course O. Code	Course Outcome
C310910.6	Student can able to understand Road Safety Education

310911: Non Credit Course -1: MOOC Course-I- Spoken Tutorial-LINUX

Course O. Code	Course Outcome
C310911.1	To get best teaching learning resources to become able to join the mainstream of knowledge economy.
C310911.2	To learn latest web and video courses from IIT.
C310911.3	To learn various free and open source software all by oneself.

FYMCA(A.Y.-2020-2021)

MCA(Under faculty of Science and Technology)Semester-II 2020 Pattern

310912 Database Management System

Course O. Code	Course Outcome
C310912.1	Design E-R Model for given requirements and convert the same into database tables.
C310912.2	Use database techniques such as SQL & PL/SQL.
C310912.3	Use modern database techniques such as NOSQL.
C310912.4	Explain transaction Management in relational database System.
C310912.5	Describe different database architecture and analyses the use of appropriate architecture in realtime environment.
C310912.6	Students will be able to use advanced database Programming concepts Big Data – HADOOP

310913 Computer Network

Course O. Code	Course Outcome
C310913.1	Analyze the requirements for the organizational structure to select the most appropriate networking architecture, topologies, transmission mediums, and technologies.
C310913.2	Demonstrate design issues, flow control and error control.
C310913.3	Analyze data flow between TCP/IP model using Application, Transport and Network Layer protocols.
C310913.4	Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.
C310913.5	Illustrate Client-Server architectures and prototypes by the means of correct standards and technology.
C310913.6	Demonstrate different routing and switching algorithms.

3109014 Java Programming

Course O. Code	Course Outcome
C310914.1	Describe the core concept of Java programming
C310914.2	Discover the need for working with the multi threading and file handling
C310914.3	Illustrate the purpose of applet and AWT in Java programming
C310914.4	Indicate the use of database connectivity using Java Programming
C310914.5	Articulate the networking concepts in Java
C310914.6	Implement Servlet and JSP concepts in Java

310915 Operating System

Course O. Code	Course Outcome
C310915.1	Fundamental understanding of the role of Operating Systems.
C310915.2	To understand the concept of a process and thread.
C310915.3	To apply the concept of process scheduling.
C310915.4	To apply the concept of process synchronization, mutual exclusion and the deadlock
C310915.5	To realize the concept of disk scheduling and File system
C310915.6	To understand the various memory management techniques.

310916: Elective-II-Mobile Computing

Course O. Code	Course Outcome
C310916.1	Describe the concept and technique of wireless telephony
C310916.2	Explain the concept of wireless networking
C310916.3	Describe data management issue of mobile wireless network.
C310916.4	Discuss the mobile operating system.
C310916.5	Design Android mobile application
C310916.6	Manage database and features of mobile application.

310917 Database Management System Laboratory

Course O. Code	Course Outcome
C310917.1	Design E-R Model for given requirements and convert the same into database tables.
C310917.2	Use database techniques such as SQL & PL/SQL.
C310917.3	Use modern database techniques such as NOSQL.
C310917.4	Explain transaction Management in relational database System.
C310917.5	Describe different database architecture and analyses the use of appropriate architecture in realtime environment.
C310917.6	Students will be able to use advanced database Programming concepts Big Data – HADOOP

310918 Operating System Lab

Course O. Code	Course Outcome
C310918.1	Understand the basics of Linux commands and program the shell of Linux.
C310918.2	Develop various system programs for the functioning of operating system.
C310918.3	Implement basic building blocks like processes, threads
C310918.4	Develop various system programs for the functioning of OS concepts in user space like concurrency control and file handling in Linux.
C310918.5	Implement page replacement algorithm.
C310918.6	Develop the system program for the functioning of OS concepts in kernel space like embedding the system call in any Linux kernel.

310919 Java Programming Laboratory

Course O. Code	Course Outcome
C310919.1	Describe the core concept of Java programming
C310919.2	Discover the need for working with the multi threading and file handling
C310919.3	Illustrate the purpose of applet and AWT in Java programming
C310919.4	Indicate the use of database connectivity using Java Programming
C310919.5	Articulate the networking concept in Java.
C310919.6	Implement java servlet and JSP concept in Java

310920 Project Based Learning-I

Course O. Code	Course Outcome
C310920.1	Analyze and solve problems by using programming knowledge
C310920.2	Prepare requirements and Design Documents
C310920.3	Develop Inter-personal and leadership qualities
C310920.4	Demonstrate system with results and interpretation
C310920.5	Describe software testing methods
C310920.6	Design and develop technical documentation

310921: Audit Course-II-Environmental Studies

Course O. Code	Course Outcome
C310921.1	Recognize the physical, chemical, and biological components of the earth's systems and show how they function.
C310921.2	See how natural systems and human-designed systems work together, as well as in conflict with each other.

C310921.3	Correlate the human population growth and its trend to the environmental degradation.
C310921.4	Identify different types of environmental pollution and control measures
C310921.5	Correlate the exploitation and utilization of conventional and non- conventional resources.

310922: Non Credit Course -1: MOOC Course-I- Spoken Tutorial-
PHP and MYSQL

Course O. Code	Course Outcome
C310922.1	To get best teaching learning resources to become able to join the mainstream of knowledge economy.
C310922.2	To learn latest web and video courses from IIT.
C310922.3	To learn various free and open source software all by oneself.

SYMCA(A.Y.-2021-2022)

MCA(Under faculty of Science and Technology)Semester-III 2020 Pattern

410901: Data Science

Course O. Code	Course Outcome
C410901.1	Explain flow process for data science problems.
C410901.2	Elaborate data preprocessing and warehouse.
C410901.3	Utilize various classification techniques for commercially available datasets.
C410901.4	Implement association rule mining for commercially available datasets.
C410901.5	Apply standard clustering methods for commercially available datasets.
C410901.6	Compare appropriate data visualization method for effective visualization of data.

410902: Web Technologies

Course O. Code	Course Outcome
C410902.1	Design web-based application using client-side Technology.
C410902.2	Develop the structure of web sites using XML components.
C410902.3	Analyze current client-side web technologies: JavaScript in detail.
C410902.4	Apply recent client-side web technologies: Angular JS in detail.
C410902.5	Apply the server side technologies for web development
C410902.6	Create the effective web applications for business functionalities using ASP.NET

410903: Cloud Computing

Course O. Code	Course Outcome
C410903.1	Understand the different Cloud Computing environment
C410903.2	Use appropriate data storage technique on Cloud
C410903.3	Analyze virtualization technology
C410903.4	Develop and deploy applications on Cloud
C410903.5	Apply security in cloud applications
C410903.6	Use advance techniques in Cloud Computing

410904C: Elective: II- Object Oriented Analysis and Design

Course O. Code	Course Outcome
C410904.1	Analyze the problem statement (SRS) and choose proper design technique for designing web-based/ desktop application
C410904.2	Apply static modeling design to applications.
C410904.3	Understand application of UML in different systems
C410904.4	Apply dynamic modeling design to applications.
C410904.5	Evaluate software architectures
C410904.6	Understand various software design patterns

410905: Software Testing and Quality Assurance

Course O. Code	Course Outcome
C410905.1	Illustrate different approaches of quality management, assurance, and quality standard to software system
C410905.2	Create test plan, test cases and defect repository using case study.
C410905.3	Apply the concept of white box and block box testing techniques
C410905.4	Analyze various testing types
C410905.5	To analyze recent automation tools for software testing.
C410905.6	Apply software testing automation concepts using Selenium

410906: Web Technologies Lab

Course O. Code	Course Outcome
C410906.1	Design web-based application using client-side Technology.
C410906.2	Develop the structure of web sites using XML components.
C410906.3	Analyze current client-side web technologies: JavaScript in detail.
C410906.4	Understand recent client-side web technologies: Angular JS in detail.
C410906.5	Understand current server-side web technologies and uses.
C410906.6	Analyze ASP.NET in detail.

410907: Computer Laboratory
(Software Testing Laboratory + Elective II Laboratory)

Course O. Code	Course Outcome
C410907.1	Implement white box and block box testing techniques for any software systems
C410907.2	Create Test plan and test cases using case studies.
C410907.3	Apply automation testing using tools.
C410907.4	Apply static modeling design to applications.
C410907.5	Understand application of UML in different systems
C410907.6	Apply dynamic modeling design to applications.
C410907.7	Understand various software design patterns

410908: Data Science Laboratory

Course O. Code	Course Outcome
C410908.1	Describe framework of any Data Analytics Tool
C410908.2	Write basic applications using the fundamentals of any Data Analytics Tool.
C410908.3	Apply Modeling techniques using any Data Analytics Tool.
C410908.4	Implement Mining techniques using any Data Analytics Tool
C410908.5	Employ data analysis using graphs.
C410908.6	Implement Data Visualization

410909: Project Based Learning –II (Mini Project- II)

Course O. Code	Course Outcome
C410909.1	Identify the real life problem from societal need point of view
C410909.2	Choose and compare alternative approaches to select most feasible one
C410909.3	Analyze and synthesize the identified problem from technological perspective
C410909.4	Design the reliable and scalable solution to meet challenges

C410909.5	Inculcate the habit of lifelong learning.
C410909.6	Design and develop technical documentation

410910B:AC3 – II: Professional Ethics and Etiquettes

Course O. Code	Course Outcome
C410910.1	Describe the major elements of ethical theory.
C410910.2	Analyze and present results of complex ethics cases.
C410910.3	Develop basic life skills or etiquettes in order to succeed in corporate culture.
C410910.4	Acquire effective writing skills for drafting academic, business and technical documents
C410910.5	Demonstrate the understanding of professionalism in terms of workplace behaviors and relationships
C410910.6	Develop professional attitude

410911: NCC3: MOOC Course-III- Spoken Tutorial-Java Business Application

Course O. Code	Course Outcome
C410911.1	To get best teaching learning resources to become able to join the mainstream of knowledge economy.
C410911.2	To learn latest web and video courses from IIT.
C410911.3	To learn various free and open source software all by oneself.

SYMCA(A.Y.-2021-2022)

MCA(Under faculty of Science and Technology)Semester-IV 2020 Pattern

410912: Major Project

Course O. Code	Course Outcome
C410912.1	Learn team work and professionalism.
C410912.2	Apply SDLC to project
C410912.3	Apply communication and presentation skills
C410912.4	Recognize the importance of documentation.

410913: Seminar on Major Project

Course O. Code	Course Outcome
C410913.1	Analyze recent topic or emerging trends
C410913.2	Summarize literature survey
C410913.3	Identify, understand and discuss current real-world issues.
C410913.4	Suggest future scope for the topic
C410913.5	Use professional ethics
C410913.6	Develop proficiency in presentation skills and written communication

410914B:AC4-II Digital and Social Media Marketing

Course O. Code	Course Outcome
C410914.1	Understand social media marketing
C410914.2	Define social media marketing goal setting necessary to achieve successful online campaigns.
C410914.3	Understand digital marketing concepts

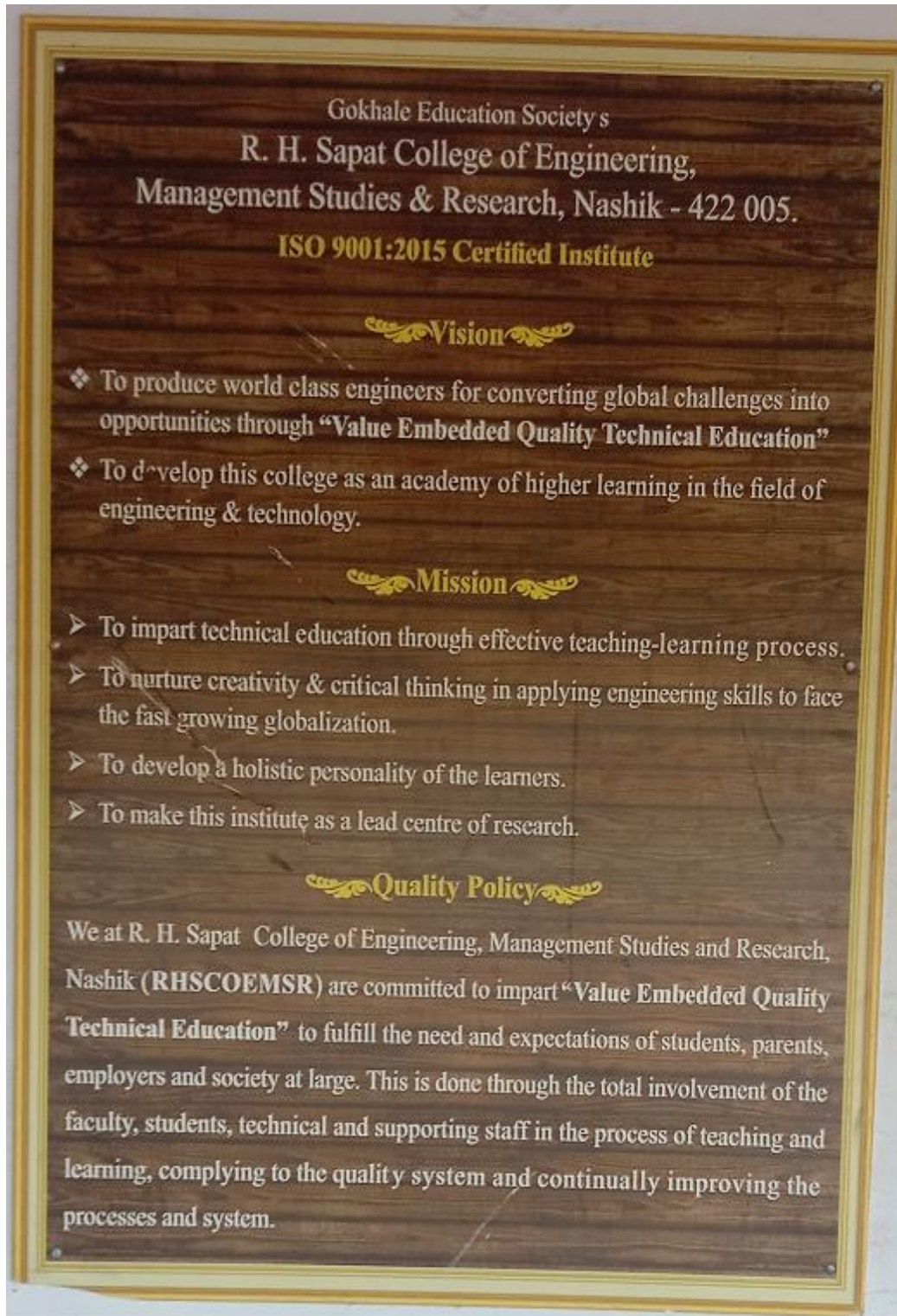| Program Outcomes(POs)-2020-2022	
MCA(under Science and Technology)	
2020 Pattern	
PO1	Apply knowledge of mathematics, computer science, computing specializations appropriate for real world applications.
PO2	Identify, formulate, analyze and solve complex computing problems using relevant domain disciplines.

PO3	Design and evaluate solutions for complex computing problems that meet specified needs with appropriate considerations for real world problems.
PO4	Find solutions of complex computing problems using design of experiments, analysis and interpretation of data.
PO5	Apply appropriate techniques and modern computing tools for development of complex computing activities.
PO6	Apply professional ethics, cyber regulations and norms of professional computing practices.
PO7	Recognize the need to have ability to engage in independent and life-long learning in the broadest context of technological change.
PO8	Demonstrate knowledge and understanding of the computing 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.
PO9	Communicate effectively with the computing 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.
PO10	Assess societal, environmental, health, safety, legal and cultural issues within local and global contexts, and the consequent responsibilities relevant to the professional computing practices.
PO11	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary environments.
PO12	Identify a timely opportunity and use innovation, to pursue opportunity, as a successful Entrepreneur /professional.
Program Specific Outcomes(PSOs)-2020-2022	
MCA(under Science and Technology)	
2020 Pattern	
PSO1	Professional Skills-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytic, and networking for efficient design of computer-based systems of varying.
PSO2	Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
PSO3	Successful Career and Entrepreneurship- The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

2.Display boards outside departments for communicating vision, mission, POs, PEOs, PSOs

Gokhale Education Society's
R. H. Sapat College of Engineering,
Management Studies & Research, Nashik - 422 005.

ISO 9001:2015 Certified Institute

Vision

❖ To produce world class engineers for converting global challenges into opportunities through **"Value Embedded Quality Technical Education"**

❖ To develop this college as an academy of higher learning in the field of engineering & technology.

Mission

➢ To impart technical education through effective teaching-learning process.

➢ To nurture creativity & critical thinking in applying engineering skills to face the fast growing globalization.

➢ To develop a holistic personality of the learners.

➢ To make this institute as a lead centre of research.

Quality Policy

We at R. H. Sapat College of Engineering, Management Studies and Research, Nashik (**RHSCOEMSR**) are committed to impart **"Value Embedded Quality Technical Education"** to fulfill the need and expectations of students, parents, employers and society at large. This is done through the total involvement of the faculty, students, technical and supporting staff in the process of teaching and learning, complying to the quality system and continually improving the processes and system.

Gokhale Education Society's
R H Sapat College of Engineering, Management Studies And Research, Nashik

Department of MCA Engineering

Vision

Empowerment through "Value Embedded Quality Technical Education" to produce globally competent professionals, researchers, innovators and entrepreneurs for development of self and society.

Mission

To bridge the gap between industry and academia by focusing on industrial internship to cater societal needs.

To instill learning ability through collaborative and interdisciplinary activities.

To impart distinct education to stream graduates coming from Commerce and Arts background thus channelizing them towards employability.

To kindle competent professionals to become part of the industry and research organizations at the National and International Levels.

Program Specific Outcomes

1. Professional Skills-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying.

2. Problem-Solving Skills- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

3. Successful Career and Entrepreneurship- The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.

PRINCIPAL
G.E.S.'s R.H. Sapat Collage of Engg.,
Mgt. Studies & Research
Prin. T.A. Kulkarni Vidya Nagar, Nashik-5.