S.P.B. PATEL
ENGINEERING COLLEGE
SAFFRONY INSTITUTE OF TECHNOLOGY CAMPUS

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CYCLE 1
NAAC Accreditation 2023

Mechanical Engineering

Course Outcome

Submitted to

NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

BACHELOR OF Mechanical Engg.(BE)		
SEMESTER I		
Course Code:	**Course Name**	**PROGRAMMING FOR PROBLEM SOLVING**
3110003	Course Outcomes (CO)	CO1: Formulate algorithm/flowchart for given arithmetic and logical problem
		CO2: Translate algorithm/flowchart into C program using correct syntax and and execute it
		CO3: Write programs using conditional, branching, iteration, and recursion
		CO4:Decompose a problem into function
		CO5:Develop an application using the concepts of array, pointer,structure, and file management to solve engineering and/or scientific problems
	Credits	4(48)
Course Code:	**Course Name**	**ENVIRONMENTAL SCIENCE**
3110007	Course Outcomes (CO)	CO1: Identify the types of pollution in society along with their sources
		CO2: Realize the global environmental issues
		CO3: Conceptualize the principles of Green Buildings and Smart cities
		CO4:Implement the concept of recycle and reuse in all fields of engineering
	Credits	0
Course Code:	**Course Name**	**BASIC ELECTRONICS**
3110016	Course Outcomes (CO)	CO1: Analyze the general – and special-Purpose diode circuits
		CO2: Design biasing circuits for BJT
		CO3: Analyze BJT Circuits in small-signal domain
		CO4:Analyze basic FET Circuits
		CO5:Verify the functionalities of basic digital gates and logic families
		CO6:Construct and test circuit using basic electronic devices in a group
	Credits	4(48)
3110006	**Course Name**	**BASIC MECHANICAL ENGINEERING**
	Course Outcomes (CO)	CO1: Discuss the various sources of energy and basic terminology of Mechanical engineering.
		CO2: Make calculations for commonly used working fluids i.e. ideal gases and steam
		CO3: Analyze various heat engine cycles and understand construction and working of IC engines.

		CO4: Discuss working and applications of steam boilers and various energy conversion systems.
		CO5: Discuss various power transmission elements and properties of various engineering materials with their applications.
	Credits	5(60)
Course Code:	**Course Name**	**Mathematics-1**
3110014	Course Outcomes (CO)	CO1: To apply differential and integral calculus to improper integrals and to determine applications of definite integral. Apart from some other applications they will have a basic understanding of indeterminate forms,Beta and Gamma functions.
		CO2: To apply the various tests of convergence to sequence, series and the tool of power series and fourier series for learning advanced Engineering Mathematics.
		CO3: To compute directional derivative, maximum or minimum rate of change and optimum value of functions of several variables.
		CO4:To compute the areas and volumes using multiple integral techniques.
		CO5:To perform matrix computation in a comprehensive manner.
	Credits	5(60)
SEMESTER II		
3110013	**Course Name**	**ENGINEERING GRAPHICS & DESIGN**
	Course Outcomes (CO)	CO1: Know and understand the conventions and the methods of engineering drawing
		CO2: Interpret engineering drawings using fundamental technical mathematics
		CO3: Construct basic and intermediate geometry and comprehend the theory of projection
		CO4:Improve their visualization skills so that they can apply these skills in developing new products
		CO5:Improve their technical communication skill in the form of communicative drawings
		CO6:Use computer software for engineering drawing
	Credits	4(48)
Course Code:	**Course Name**	**Mathematics-2**
3110015	Course Outcomes (CO)	CO1: To apply mathematical tools needed in evaluating vector calculus and their usage like Work, Circulation and Flux.

		CO2: To apply the laplace transform as tools which are used to solve differential equations and fourier integral representation.
		CO3: To apply effective mathematical tools for the solutions of first order ordinary differential equations.
		CO4:To apply effective mathematical methods for the solutions of higher order ordinary differential equations.
		CO5:To use series solution methods and special functions like Bessels' functions.
	Credits	5(60)
Course Code:	**Course Name**	**BASIC ELECTRICAL ENGINEERING**
3110005	Course Outcomes (CO)	CO1: Apply fundamental electrical laws and circuit theorems to electrical circuits.
		CO2: Analyze single phase and three phase AC circuits.
		CO3: Describe operating principle and applications of static and rotating electrical machines.
		CO4:Comprehend electrical installations, their protection and personnel safety.
	Credits	4(48)
3110012	**Course Name**	**WORKSHOP/ MANUFACTURING PRACTICES**
	Course Outcomes (CO)	CO1: Understand various manufacturing processes in machine shop and perform basic operations of welding, fitting, smithy and carpentry work a) perform basic operations of welding, fitting, smithy and carpentry work b) Explain various manufacturing processes in machine shop
		CO2: Discuss application of plumbing fitting, masonry items and about plastic molding and glass cutting for various engineering application
		CO3: Measure different electrical quantities and trouble shoot electrical and electronics appliances
		CO4:Conduct experiments with various kits such as Raspberry and Arduino for embedded system development
		CO5:Use basic commands of computer operating systems
	Credits	2(24)
Course Code:	**Course Name**	**PHYSICS**

3110018	Course Outcomes (CO)	CO1:The student will gain knowledge of basic theoretical and mathematical concept of electronic materials.
		CO2:The student will demonstrate understanding of basic principles, properties and applications associated with semiconducting materials.
		CO3:The student will demonstrate understanding of basic theory and properties associated with optoelectronic materials.
		CO4:The student will gain knowledge of the different measurements techniques to characterize various semiconducting, electrical and optoelectrical materials and devices.
		CO5:The student will demonstrate understanding of basic theory, properties and applications of Superconductivity.
	Credits	4(48)
Course Code:	**Course Name**	**ENGLISH**
3110002	Course Outcomes (CO)	CO1:Use various forms of vocabulary in varied situations in oral and written communication.
		CO2:Understand the phonetics and the transcription pattern to learn correct pronunciation.
		CO3:Comprehend the dynamics of various rules of grammar and check its validation while they speak and write language correctly.
		CO4:Use grammar effectively to make themselves competent Listener, Speaker, Reader and Writer by exposing to various set of situations.
		CO5:Write various formal and informal documents of day to day life and professional set up.
		CO5:Demonstrate the qualities of writing in diverse situation by using the nuances such as conciseness, clarity, accuracy, organization, and coherence.
	Credits	3(36)
SEMESTER III		
Course Code:	**Course Name**	**Sample**
	Course Outcomes (CO)	CO1:Define and classify various data structures, storage structures and common operations on them.
		CO2: Create various linear data structures with their representation and perform different operations on them

		CO3: Create various nonlinear data structures with their representation and perform different operations on them.
		CO4:Apply various searching sorting techniques on data set.
		CO5:Solve the given a problem using an appropriate data structure to achieve optimal performance and compare its performance with other possible data structures
	Credits	5(60)
3131905	**Course Name**	**Engineering Thermodynamics**
	Course Outcomes (CO)	CO1:To identify the unique vocabulary associated with thermodynamics and explain the basic concepts of thermodynamics
		CO2:To state and apply first law of thermodynamics for closed and open systems undergoing different thermodynamic processes and evaluate the feasibility of thermodynamic cycles and processes using second law of thermodynamics
		CO3:To apply the concept of entropy and exergy to different thermodynamic processes and cycles
		CO4:To analyze different gas power, vapor power and refrigeration cycles
		CO5:To make elementary calculation of combustion phenomenon
	Credits	5(60)
3131906	**Course Name**	**KINEMATICS AND THEORY OF MACHINES**
	Course Outcomes (CO)	CO1: Understand basic structure and elements of machines
		CO2: Identify functional characteristics of various machine elements
		CO3: Synthesize various mechanisms based on position, velocity and acceleration requirement.
		CO4: Determine position, velocity and acceleration of linkages in mechanism at any instant.
		CO5: Understand basics related to friction and its practical application in mechanical engineering
	Credits	5(52)
3131904	**Course Name**	**Material Science and Metallurgy**
	Course Outcomes (CO)	CO1:Understand the basic concept of Material Science and Metallurgy
		CO2:Know about the ferrous and non ferrous metals and alloys and their applications

		CO3:Understand different non-destructive testing methods
		CO4:Find the causes and prevention of metallic corrosion
		CO5:Judge the Scope and limitations of different materials
	Credits	4 (45)
2130003	**Course Name**	**Mechanics of Solids**
	Course Outcomes (CO)	CO1:Apply fundamental principles of mechanics & principles of equilibrium
		CO2:Apply principles of statics to determine reactions & internal forces
		CO3:Determine centroid and moment of inertia of different geometrical shapes
		CO4:Know basics of friction and its importance through simple applications
		CO5:Understand the different types of stresses and strains in members
	Credits	6 (45)
2130002	**Course Name**	**Advance Engineering Mathematics**
	Course Outcomes (CO)	Identify functions that are periodic. Determine their periods
		Recall and apply the convergence theorem for Fourierseries
		Model physical processes using differential equations
		Use the solution of an initial value problem to answer questions about a physicalsystem.
		Analyze the behavior of solutions
	Credits	5(42)
	Course Name	**Complex Variables and Partial Differential Equations**
3130005	Course Outcomes (CO)	CO1:convert complex number in a polar form, plot the roots of a complex number in complex plane, find harmonic conjugate of analytic functions and apply conformal mapping in geometrical transformation
		CO2:evaluate complex integration by using various result, test convergence of complex sequence and series and expand some analytic function in Taylor's series
		CO3:find Laurent's series and pole of order, and apply Cauchy Residue theorem in evaluating some real integrals
		CO4:form and solve first order linear and nonlinear partial differential equations

		CO5:apply the various methods to solve higher order partial differential equations, modeling and solve some engineering problems related to Heat flows, Wave equation and Laplace equation
	Credits	5(42)
3130004	**Course Name**	**Effective Technical Communication**
	Course Outcomes (CO)	CO1:Define and discuss dynamics of Verbal and Non Verbal aspects of Communication
		CO2:Write various formal documents of technical and professional communication
		CO3:Communicate in diverse formal situations taking place in organizations
		CO4:Illustrate and examine the knowledge of ethical aspects of engineering
		CO5:Demonstrate and explain social and professional etiquettes
		CO6:Plan self-development and practice self-assessment
	Credits	3(36)
2131903	**Course Name**	**Manufacturing Process-I**
	Course Outcomes (CO)	CO1:Understand the basic concept of machining operations
		CO2:Analyze any conventional machining processes
		CO3:Generate the sequence of machining operation to produce the end product
		CO4:Judge the limitations and scope of machines to perform a variety of operations
	Credits	5 (50)
SEMESTER IV		
3141909	**Course Name**	**Organisational Behaviour**
	Course Outcomes (CO)	CO1:Students will be able to understand various methods and terms used different organizational behaviour model
		CO2:Students will be able to understand Individual Behaviour like attitude, perception, motivation, personality, misbehaviour and emotions
		CO3:Students will be able to understand group behaviour, leadership and power
		CO4:Students will be able to understand dynamics of organizational behaviour and managing change
	Credits	3(42)
3141908	**Course Name**	**Manufacturing Processes**

	Course Outcomes (CO)	CO1:Understand the basic concept of machining operations
		CO2:Analyze conventional machining processes
		CO3:Study, understand and generate the sequence of machining operation to produce the end product
		CO4:Judge the limitations and scope of machines to perform variety of operations
	Credits	5(45)
3141907	**Course Name**	**FUNDAMENTAL OF MACHINE DESIGN**
	Course Outcomes (CO)	CO1: understand fundamentals of material selection, strength of materials and loading patterns of machine elements
		CO2: distinguish basic failure modes of machine elements.
		CO3: analyse beams and columns for stresses and deflection.
		CO4: design and analyse machine components under static loading
		CO5: design and analyze machine components under variable loading
	Credits	5(60)
3141901	**Course Name**	**Mechanical Measurement and Metrology**
	Course Outcomes (CO)	CO1:Summarize various methods and terms used in mechanical measurements and metrology.
		CO-2:Measure mechanical quantities like Force, Temperature, Pressure, Velocity, Acceleration, Strain and Torque.
		CO-3:Apply concepts of metrology for gears, threads and surface finish
		CO-4:Utilize various precision machines working based on Laser technology and coordinate measuring methods.
	Credits	5 (60)
3141906	**Course Name**	**Fluid Mechanics and Hydraulics Machines**
	Course Outcomes (CO)	CO-1:Explain various fluid properties and behavior of fluid in static and dynamic mode.
		CO-2:Make use of dimensional analysis and interpret types of fluid flow.
		CO-3:Analyze theory of impact of jet and apply the same for hydraulic turbine.
		CO-4:Evaluate performance of centrifugal pumps

	Credits	5 (60)
2140003	**Course Name**	**Engineering Economics and Management**
	Course Outcomes (CO)	CO1:Impart knowledge of concepts, principles, and practical applications of Economics governing firm/organization functioning under different market conditions
		CO2:Help students understand fundamental concepts and principles of management, roles, skills, functions of management, organizational structures, and basic marketing knowledge
	Credits	3 (47)
2141905	**Course Name**	**Complex Variables and Numerical Methods**
	Course Outcomes (CO)	CO1:Analyze and apply complex numbers, functions, and their properties in mathematical and engineering contexts
		CO2:Evaluate complex integrals and apply Cauchy's Theorem in solving engineering problems
		CO3:Utilize power series and contour integration techniques to solve problems in complex analysis
		CO4:Apply numerical methods, including interpolation and numerical integration, to solve engineering problems involving complex functions
	Credits	5 (42)
2141906	**Course Name**	**Fluid Mechanics**
	Course Outcomes (CO)	CO1:Understand the basic concept of fluid mechanics
		CO2:Understand statics, dynamics and various approaches to fluid mechanics
		CO3:Understand fundamentals of flow through pipes
		CO4:Understand basics of compressible flow
		CO5:Correlate fundamentals of fluid mechanics with various mechanical systems
	Credits	6 (56)
2141907	**Course Name**	**Machine Design & Industrial Drafting**
	Course Outcomes (CO)	CO1:Analyse components subjected to various mechanical loads
		CO2:Analyse beams and columns for stresses and deflection

		CO3:Design and analyse shafts, keys and couplings
		CO4:Select fasteners and design welded / riveted joints
		CO5:Generate and interpret assembly and production drawings
	Credits	6 (54)
2141908	**Course Name**	**Manufacturing Processes -II**
	Course Outcomes (CO)	CO1:Demonstrate the ability to think in core concepts of engineering applications by studying various topics involved in branch-specific applications
		CO2:Demonstrate the ability to use different processes and their process parameters to obtain qualitative solutions
		CO3:Understand the relevance and importance of different manufacturing techniques and their real-life applications in industry
		CO4:Learn about different process parameters
	Credits	5 (45)
SEMESTER V		
3151909	**Course Name**	**Heat Transfer**
	Course Outcomes (CO)	CO1:To classify the heat transfer problems and to apply the principles of steady state one dimensional heat transfer, extended surface and unsteady state conduction for commonly encountered Mechanical engineering problems
		CO2:To identify the type of convection problems and to apply concepts of natural and forced convection for related problems
		CO3:To explain various laws of radiation heat transfer and to determine the radiation heat transfer between black and grey surfaces of simple Mechanical systems
		CO4:To practice LMTD and effectiveness-NTU method for simple heat exchange device
		CO5:To identify types of boiling and condensation heat transfer process and to use the same to estimate heat transfer coefficient for simple cases
	Credits	5(56)
3151912	**Course Name**	**Manufacturing Technology**
	Course Outcomes (CO)	CO1:Interpret foundry practices like pattern making, mold making, Core making and Inspection of defects

		CO2:Differentiate various metal forming processes
		CO3:Select appropriate metal joining Processes to join similar or dissimilar metals
		CO4:Classify different plastic moulding processes and application
		CO5:Distinguish different Super Finishing Technology
	Credits	4(45)
3151911	**Course Name**	**DYNAMICS OF MACHINERY**
	Course Outcomes (CO)	CO1: Summarize dynamic forces and turning moments in mechanisms
		CO2: Minimize unbalance in mechanical systems by means of static and dynamic balancing
		CO3: Analyze gyroscopic effect in aeroplane, ships and automobiles
		CO4: Demonstrate longitudinal vibrations, transverse vibrations and torsional vibrations in single degree of freedom systems
		CO5: Determine critical speed of the shaft
	Credits	5(49)
3151913	**Course Name**	**Oil Hydraulics and Pneumetics**
	Course Outcomes (CO)	CO1:Demonstrate components for hydraulic and pneumatic systems and their applications
		CO2:Interpret functions of different hydraulic and pneumatic valves and make use of them in circuit design
		CO3:Design and analyze hydraulic and pneumatic circuits for specific applications
		CO4:Compile and make use of automation in hydraulic and pneumatic systems
	Credits	3 (45)
3151910	**Course Name**	**Operation Research**
	Course Outcomes (CO)	CO1:Develop models for optimizing the management and production systems
		CO2:Make use of LPP techniques for optimization of Production mix problem
		CO3:Evaluate transportation, transhipment, assignment, and Queuing problem
		CO4:Apply quantitative techniques in machine replacement, game theory, business decision making under conditions of certainty, risk, and uncertainty
		CO5:Demonstrate Project management Problem
	Credits	

2151908	**Course Name**	**Control Engineering**
	Course Outcomes (CO)	CO1:Understand the methodology for modelling dynamic systems with stability
		CO2:Know the transfer function, signal flow graph representation of linear systems & their controlling actions
		CO3:Understand concept of time, frequency response as well as concept of state-space models and their relation to frequency domain models
		CO4:Control system of hydraulic and pneumatic system
	Credits	
SEMESTER VI		
3161917	**Course Name**	**Computer Aided Manufacturing**
	Course Outcomes (CO)	CO1:Illustrate Computer Aided Manufacturing with NC, CNC and PLC technology for Industry
		C02:Describe the Group Technology and Computer Aided Process Planning
		CO3:Describe Flexible Manufacturing System with tools and equipment's
		CO4:Describe Robot technology for Computer Aided Manufacturing system
		CO5:Demonstrate Integrated Production Management system
	Credits	4(42)
3161926	**Course Name**	**INDUSTRY 4.0**
	Course Outcomes (CO)	CO1:Describe Industry 4.0 and scope for Indian Industry
		CO2:Demonstrate conceptual framework and road map of Industry 4.0
		CO3:Describe Robotic technology and Augmented reality for Industry 4.0
		CO4:Demonstrate obstacle and framework conditions for Industry 4.0
	Credits	3(42)
3161910	**Course Name**	**Applied Thermodynamics**
	Course Outcomes (CO)	CO1:To apply various gas laws of real gas and their mixture, to make use of psychrometric properties to identify basic psychrometric processes
		CO2:To experiment with vapor compression and vapor absorption systems

		CO3:To explain fuel-air and actual cycles for IC engines and to develop understanding of IC engines testing and their emission norms
		CO4:To apply fundamental of compressible fluid flow
		CO5:To demonstrate various air compressors and experiment with them
	Credits	5(56)
3161913	**Course Name**	**Industrial Safety and Maintenance Engineering**
	Course Outcomes (CO)	CO-1:Describe Quality, Reliability and Maintainability
		CO-2:Understand the principles, functions and practices adapted in industry for the successful management of maintenance activities.
		CO-3:Demonstrate Defects and Failure analysis and different types of maintenance system
		CO-4:Differentiate various Maintenance Planning and Scheduling techniques
		CO-5:Demonstrate safety practice aspects in industry.
	Credits	4 (45)
3161920	**Course Name**	**Automobile Engineering**
	Course Outcomes (CO)	CO1:Compare and select type of vehicle as per safety, features and applications
		CO2:Evaluate vehicle performance for different driving and road conditions
		CO3:Demonstrate working of various Automobile Systems
		CO4:Study of wheel and tyre, identity faults and diagnosis of automobile systems
		CO5:Study of modern hybrid Automobiles
	Credits	4 (45)
SEMESTER VII		
3171910	**Course Name**	**Power Plant Engineering**
	Course Outcomes (CO)	CO1:Explain the layout, construction and working of the components of thermal, Diesel, Gas and Combined cycle power plants
		CO2:Explain the layout, construction and working of the components of Nuclear power plants
		CO3:Explain the layout, construction and working of the components of Renewable Energy power plants

		CO4:Explain the applications of power plants while extending their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production
	Credits	3(45)
3171917	**Course Name**	**Design of Machine Elements**
	Course Outcomes (CO)	CO1:Relate various standard used in industry and utilize knowledge of manufacturing process in design of machine elements
		CO2:Determine forces acting on machine elements like couplings, springs, gears, bearings and perform stress analysis for machine components
		CO3:Estimate life of rolling element bearings and determine performance parameters of sliding contact bearings
		CO4:Evaluate speed variation on gear box shafts and optimize fluctuation of shaft speeds in gear box
		CO5:Design and dissect mechanisms for strength and improve their life
	Credits	4(47)
3171926	**Course Name**	**RAPID PROTOTYPING**
	Course Outcomes (CO)	CO1: Distinguish RP and other related technology
		CO2: Understand and use techniques for processing of CAD models for rapid prototyping.
		CO3: Apply fundamentals of rapid prototyping techniques.
		CO4: Use appropriate tooling for rapid prototyping process
		CO5: Create component with RP applications
	Credits	4(45)
3171918	**Course Name**	**Refrigeration and Air conditioning**
	Course Outcomes (CO)	CO-1:To select proper refrigerant for various applications and make basic calculations of aircraft refrigeration.
		CO-2:To analyze multi-evaporator systems and simple vapor absorption systems.
		CO-3:To explain construction and working of different refrigeration system components.
		CO-4:To solve air-conditioning load calculations for buildings and automobiles

		CO-5:To select proper air-conditioning system for various applications and construct duct layout for the systems.
	Credits	4 (45)
3171506	**Course Name**	**Project management**
	Course Outcomes (CO)	CO1:Demonstrate the fundamentals of project management and its organization
		CO2:Utilize the concepts of project organizing, project planning and its budgeting
		CO3:Analyze the project network and resource allocation in projects
		CO4:Illustrate the project monitoring and control
		CO5:Choose evaluating and terminating the Project
	Credits	4 (45)
Course Code:	**Course Name**	**Industrial Internet of Things**
	Course Outcomes (CO)	CO1:Describe Industrial Internet of Things and Cyber Physical manufacturing
		CO2:Demonstrate Cyber Physical and Cyber Manufacturing systems
		CO3:Describe Architectural design patterns for industrial Internet of Things
		CO4:Analyse AI and data Analytics for Industrial Internet of Things
		CO5:Evaluation of Workforce and Human Machine Interaction and Application of Industrial Internet of Things
	Credits	3 (45)
SEMESTER VIII		
2181910	**Course Name**	**Renewable Energy Engineering**
	Course Outcomes (CO)	CO1:Importance of Renewable Energy (RE) sources
		CO2:Applications of different Renewable Energy (RE) sources
		CO3:Carry out preliminary economic analysis of Renewable Energy (RE) systems
	Credits	
2181916	**Course Name**	**Energy Conservation and Management**
	Course Outcomes (CO)	CO1:Understand the basic knowledge of different terms & principles of energy conservation, audit and management
		CO2:Evaluate the energy saving & conservation in different mechanical utilities

		CO3:Understand efficient heat & electricity utilization, saving and recovery in different thermal and electrical systems
		CO4:Prepare energy audit report for different energy conservation instances
	Credits	
2181923	**Course Name**	**Enterpreneurship**
	Course Outcomes (CO)	CO1:Understand Entrepreneurship
		CO2:Understand Business Models and Planning for Business
		CO3:Understand Operations and Management in business
	Mechanical Engineering - Degree	
	PSO-1	Capability to compete the available employment opportunities and solve complex engineering problems related to production, Design, Thermal and allied industries using systematic tools.
	PSO-2	Ability to apply their knowledge in principle of design and analysis, in execution of automation in mechanical system / processes.
	PSO-3	Evaluate and execute project plans in mechanical engineering, incorporating effective resource management, timelines, and risk assessment.