R K COLLEGE OF ENGINEERING

(Accredited by NAAC with 'A' Grade)

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DEPARTMENT OF MECHANICAL ENGINEERING

COURSE OUTCOMES (COs)

Course Outcomes (COs) describe what students can able to do after completion of the course.

Program	Academic Year	Semester
B.Tech- Mechanical Engineering	2023-24	I & II

S.No	Year-Sem	Course Code	Course Name	Course Outcomes After completion of the course student can able to
1	II-I	BSC-5	Vector Calculus, Fourier Transforms And PDE (M-III)	**CO1:**Interpret the physical meaning of different operators such as gradient, curl and divergence
				CO2: Estimate the work done against a field, circulation and flux using vector calculus
				CO3: Apply the Laplace transform for solving differential equations
				CO4: Find or compute the Fourier series of periodic signals
				CO5: I expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms. Identify solution methods for partial differential equations that model physical processes
2	II-I	PCC-I	Mechanics Of Solids	**CO1:** Model &Analyze the behavior of basic structural members subjected to various loading and support conditions based on principles of equilibrium
				CO2: Understand then apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads, moment and tensional moment.
				CO3: Analyze beams and draw correct and complete shear and bending moment diagrams for beams.
				CO4: understanding of the loads, stresses, and strains acting on a structure and their relations in the elastic behavior.
				CO5: Design and analysis of Industrial

				components like pressure vessels.
3	II-I	PCC-2	Fluid Mechanics & Hydraulic Machines	**CO1:**Understand The basic concepts of fluid properties
				CO2: Explain The mechanics of fluids in static and dynamic conditions.
				CO3: Explain Boundary layer theory, flow separation and dimensional analysis.
				CO4: Calculate Hydrodynamic forces of jet on vanes in different positions.
				CO5: Explain Working Principles and Evaluate performance of hydraulic pump and turbines.
4	II-I	PCC-3	Production Technology	**CO1:**Able to design the patterns and core boxes for metal casting processes
				CO2: Able to design the gating system for different metallic components
				CO3: Know the different types of manufacturing processes
				CO4: Be able to use forging, extrusion processes
				CO5: Learn about the different types of welding processes used for special fabrication
5	II-I	PCC-4	Kinematics Of Machinery	**CO1:** Contrive a mechanism for a given plane motion with single degree of freedom.
				CO2: Suggest and analyze a mechanism for a given straight line motion and automobile steering motion.
				CO3: Analyze the motion (velocity and acceleration) of a plane mechanism.
				CO4: Suggest and analyze mechanisms for a prescribed intermittent motion like opening and closing of IC engine valves etc.
				CO5: Select a power transmission system for a given application and analyze motion of different transmission systems
6	II-I	PCC-L1	Computer Aided Engineering Drawing Practice	**CO1:** Student get exposed on working of sheet metal with help of development of surfaces
				CO2: Student understands how to know the hidden details of machine components with the help of sections and interpenetrations of

				solids.
				CO3: Student shall exposed to modeling commands for generating 2D and 3D objects using computer aided drafting tools which are useful to create machine elements for computer aided analysis.
7	II-I	PCC-L2	Fluid Mechanics & Hydraulic Machines Lab	**CO1:** Understand the principles of kinematics with specific emphasis on application of continuity equation, stream function etc.
				CO2: Apply the principles of Bernoulli's equation in measurement of discharge in pipes, and in other pipe flow problems.
				CO3: Understand the working principle of pumps and turbines.
8	II-I	PCC-L3	Production Technology Lab	**CO1:** The student will be able to develop simplified manufacturing processes with the aim of reduction of cost and manpower.
				CO2: The student will be able to identify/control the appropriate process parameters, and possible defects of manufacturing processes so as to remove them.
				CO3: Operate arc welding, gas welding and resistance welding equipment
9	II-I	SOC-1	Drafting And Modeling Lab	**CO1:** Understand the benefits of computer aided design
				CO2: Understand the computer aided manufacturing of machine elements.
				CO3: Students learn modeling 3d Drawings
10	II-I	MC-3	Essence Of Indian Traditional Knowledge	CO1; Understand the concept of Traditional knowledge and its importance
				CO2: Know the need and importance of protecting traditional knowledge
				CO3: Know the various enactments related to the protection of traditional knowledge
				CO4: Understand the concepts of Intellectual property to protect the traditional knowledge
11	II-II	ESC-6	Materials Science & Metallurgy	**CO1:** Understand the crystalline structure of different metals and study the stability of phases in different alloy systems.

				CO2:Study the behavior of ferrous and non-ferrous metals and alloys and their application in different domains
				CO3:Able to understand the effect of heat treatment, addition of alloying elements on properties of ferrous metals
				CO4:Grasp the method s of making of metal powders and applications of powder metallurgy
				CO5: Comprehend the properties and applications of ceramic, composites and other advanced methods.
12	II-II	BSC-6	Complex Variables And Statistical Methods	CO1:Apply various functions in order to determine whether a given continuous function is analytic
				CO2:Find the differentiation and integration of complex functions used in engineering problems
				CO3:Make use of the Cauchy residue theorem to evaluate certain integrals
				CO4: Apply discrete and continuous probability distributions. design the components of a classical hypothesis test
				CO5:Infer the statistical inferential methods based on small and large sampling tests
13	II-II	PCC-5	Dynamics Of Machinery	CO1:Illustrate frictional losses, torque transmission of mechanical systems
				CO2: Analyze dynamic force analysis of slider crank mechanism and design of flywheel.
				CO3:Explain different types of governors involved in dynamics of Machinery
				CO4:Understand balancing of reciprocating and rotary masses
				CO5: Determine the Vibrations developed in beams with concentrated and distributed loads. Dunkerly's methods, Raleigh's method, torsion vibrations.
14	II-II	PCC-6	Thermal Engineering - I	CO1: Derive the actual cycle from fuel-air cycle and air- standard cycle for all practical applications.

				CO2: Explain working principle and various components of IC engine
				CO3: Explain combustion phenomenon of CI and SI engines and their impact on engine variables.
				CO4: Analyze the performance of an IC engine based on the performance parameters.
				CO5: Explain the cycles and systems of a gas turbine and determine the efficiency of gas turbine.
15	II-II	HSC-2	Industrial Engineering And Management	**CO1:**Design and conduct experiments, analyze, interpret data and synthesize valid conclusions
				CO2: Design a system, component, or process, and synthesize solutions to achieve desired needs
				CO3: Use the techniques, skills, and modern engineering tools necessary for engineering practice with appropriate considerations for public health and safety, cultural, societal, and environmental constraints
				CO4: Function effectively within multi-disciplinary teams and understand the fundamental precepts of effective project management
				CO5: Evaluate the valuation of building for different specifications and create new technologies to develop concrete estimating methods.
16	II-II	ESC-L4	Mechanics Of Solids And Metallurgy Lab	**CO1:** Study of the Micro Structures of Cast Irons.
				CO2: Study of the Micro Structures of Non-Ferrous alloys.
				CO3: Study of the Micro structures of Heat treated steels.
17	II-II	PCC-L6	Machine Drawing Practice	CO1. Draw and represent standard dimensions of different mechanical fasteners and joints and Couplings.
				CO2. Draw different types of bearings showing different components.
				CO3. Assemble components of a machine part and draw the sectional assembly

				drawing showing the dimensions of all the components of the assembly as per bill of materials
				CO4. Select and represent fits and geometrical form of different mating parts in assembly drawings.
				CO5: To prepare manufacturing drawings indicating fits, tolerances, surface finish and surface treatment requirements.
18	II-II	PCC-L7	Theory Of Machines Lab	CO1: To study the static and dynamic balancing using rigid blocks.
				CO2: To study simple and compound screw jack and determine the mechanical advantage , velocity ratio and efficiency
				CO3: To study various types of gears- Spur, Helical, Worm and Bevel Gears
19	II-II	SOC-2	Python Programming Lab	CO1: Solve the different methods for linear, non-linear and differential equations
				CO2: Learn the PYTHON Programming language
				CO3: Familiar with the strings and matrices in PYTHON
				CO4: Write the Program scripts and functions in PYTHON to solve the methods
20	III-I	PCC-7	Thermal Engineering-II	CO1: To understand the basic concepts of thermal engineering and boilers.
				CO2: To gain knowledge about the concepts of steam nozzles and steam turbines.
				CO3: To gain knowledge about the concepts of reaction turbine and steam condensers.
				CO4: To understand the concepts of reciprocating and rotary type of compressors.
				CO5: To acquire knowledge about the centrifugal and axial flow compressors.
21	III-I	PCC-8	Design of Machine Members-I	CO1: To understand the materials and their properties along with manufacturing considerations.
				CO2: To gain knowledge about the strength of machine elements.
				CO3: To understand and apply the knowledge in designing the riveted and

				welded joints, keys, cotters and knuckle joints
				CO4: To understand and apply the knowledge in designing the shafts and shaft couplings.
				CO5: To understand and apply the knowledge in designing the shafts and shaft couplings.
22	III-I	PCC-9	Machining, Machine Tools & Metrology	**CO1:**To gain fundamental knowledge of machining processes
				CO2: To understand the principles of lathe, shaping, slotting and planning machines.
				CO3: To demonstrate the principles of drilling, milling and boring processes.
				CO4: To understand the concepts of finishing processes and the system of limits and fits.
				CO5: To gain knowledge about the concepts of surface roughness and optical measuring instruments
23	III-I	OE-1	Sustainable Energy Technologies	**CO1:** To demonstrate the importance of solar energy collection and storage.
				CO2: To understand the principles of wind energy and biomass energy.
				CO3: To gain knowledge on geothermal and ocean energy.
				CO4: To acquire knowledge about energy efficient systems.
				CO5: To understand the concepts of green manufacturing systems.
24	III-I	PE-1	Advanced Materials	**CO1:** To gain knowledge about the metals and alloys and their utility in different environments.
				CO2: To acquire knowledge about polymers and ceramics and their applications.
				CO3: To analyze composite materials along with reinforcements and their applications.
				CO4: To understand the basics of shape memory alloys and functionally graded materials.
				CO5: To gain knowledge about the nanomaterials and their applications.
25	III-I	PCC-L6	Machine Tools Lab	**CO1:** To understand general purpose

				machine tools in the machine shop.
				CO2: To demonstrate various operations on lathe machine.
				CO3: To demonstrate different operations on drilling machine.
26	III-I	PCC-L7	Thermal Engineering Lab	**CO1:** To demonstrate the characteristics of two stroke and four stroke compression and spark ignition engines.
				CO2: To determine flash point, fire point, calorific value of different fuels using various apparatus.
				CO3: To determine engine friction, heat balance test, volumetric efficiency, load test of petrol and diesel engines.
27	III-I	SOC-3	Advanced Communication Skills Lab	**CO1:**To improve students' fluency in spoken English
				CO2: To enable them to listen to English spoken at normal conversational speed
				CO3: To help students develop their vocabulary
28	III-I	MC – 4	Professional Ethics and Human Values	**CO1:**To understand the concepts of human values.
				CO2: To gain knowledge about the principles of engineering ethics.
				CO3: To interpret engineering as social experimentation.
29	III-II	PCC-10	Heat Transfer	**CO1:** Compute rate of heat transfer for 1D, steady state composite systems without heat generation.
				CO2: Analyze the system with heat generation, variable thermal conductivity, fins and 1D transient conduction heat transfer problems.
				CO3: Develop the empirical equations for forced convection problems by using Buckingham's pi theorem.
				CO4: Compute the rate of heat transfer for natural convection systems and design and analysis of heat exchangers.
				CO5: Solve the heat transfer systems with phase change and radiation.

30	III-II	PCC-11	Design of Machine Members-II	**CO1:** Apply knowledge about the design of bearings.
				CO2: Explain the concepts in designing various engine parts.
				CO3: Utilize the knowledge to design curved beams and power screws.
				CO4: Justify power transmission systems and to design pulleys and gear drives.
				CO5: Apply the concepts in designing various machine tool elements.
31	III-II	PCC-12	Introduction to Artificial Intelligence and Machine Learning	**CO1:** Discuss basic concepts of artificial intelligence, neural networks and genetic algorithms.
				CO2: Apply the principles of knowledge representation and reasoning.
				CO3: Learn about bayesian and computational learning and machine learning.
				CO4: Utilize various machine learning techniques.
				CO5: Apply the machine learning analytics and deep learning techniques.
32	III-II	PE-2	AUTOMOBILE ENGINEERING	**CO1:** Discuss various components of four wheeler automobile.
				CO2: Apply the knowledge of different parts of transmission system.
				CO3: Judge about steering and suspension systems.
				CO4: Justify the braking system and electrical system used in automobiles.
				CO5: Analyze the concepts about engine specifications and service, safety and electronic system used in automobiles.
33	III-II	OE-2	WATER RESOURCES ENGINEERING	**CO1:** Have a thorough understanding of the theories and principles governing the hydrologic processes.
				CO2: Be able to quantify hydrologic components and apply concepts in hydrologic design of water resources projects.
				CO3: Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design

				hydraulic structures.
				CO4: Develop design storms and carry out frequency analysis.
				CO5: Develop flow mass curve and flow duration curve, apply hydrograph analysis in the design of water resources projects.
34	III-II	PCC-L8	Heat Transfer Lab	**CO1:** The student should be able to evaluate the amount of heat exchange for plane
				CO2: Evaluate cylindrical & spherical geometries
				CO3: to compare the performance of extended surfaces and heat exchangers
35	III-II	PCC-L9	CAE&CAM Lab	**CO1:** The student will be able to appreciate the utility of the modeling tools in creating 2D and 3D drawings.
				CO2: Use of these tools for any engineering and real time applications
				CO3: Acquire knowledge on utilizing these tools for a better project in their curriculum.
36	III-II	PCC-L10	Measurements & Metrology Lab	**CO1:** Demonstrate and use different length measuring instruments like vernier calipers and micrometers
				CO2: Explain different angle measuring instrument like universal bevel protractor.
				CO3: Formulate some unknown quantity or parameter of engineering interest
37	III-II	SOC-4	Artificial Intelligence and Machine Learning Lab	**C01:** Building Decision Trees for Soybean classification model using Weka or Python
				CO2: Generating association rules on Weather data using Weka or Python
				CO3: Build Neural Network Classifier using Weka or Python
38	III-II	MC-5	Research Methodology and IPR	**CO1:** Understand objectives and characteristics of a research problem
				CO2: Analyze research related information and to follow research ethics.
				CO3: Understand the types of intellectual property rights.
39	IV-I	PE-3	UNCONVENTIONAL MACHINING PROCESSES	**CO1:** Understand the concepts of modern machining processes.
				CO2: Learn the principles of ultrasonic

				machining.
				CO3: Apply the principles and procedure of electro chemical and chemical machining processes.
				CO4: Apply the principles and procedure of thermal metal removal processes
				CO5: Illustrate the principles and procedure of electron beam machining, laser beam machining and plasma machining.
40	IV-I	PE-4	Power Plant Engineering	**CO1:** Identify the different components of the steam power plant.
				CO2: Illustrate the component used in the diesel and gas power plant for power production
				CO3: Understand how the power is produced by hydro-electric and nuclear power plants
				CO4: Interpret the power production by combined power plants and operating principles of different instruments used in power plants.
				CO5: Analyze power plant economics and implementation of pollution standards and control of pollution caused by the power plants.
41	IV-I	PE-5	MECHATRONICS	**CO1:** Understand the use the various mechatronics systems, measurement systems, sensors and transducers.
				CO2: Apply the concepts of solid-state electronic devices.
				CO3: Identify the components in the design of electro mechanical systems.
				CO4: Apply the concepts of digital electronics & PLCs for control.
				CO5: Understand system interfacing, data acquisition and design of mechatronics systems.
42	IV-I	OE-3	ADDITIVE MANUFACTURING	**CO1:** Understand the principles of prototyping, classification of RP processes and liquid-based RP systems.
				CO2: Understand and apply different types

				of solid-based RP systems.
				CO3: Apply powder-based RP systems
				CO4: Analyze and apply various rapid tooling techniques.
				CO5: Understand different types of data formats and explore the applications of AM processes in various fields.
43	IV-I	OE-4	OPERATIONS MANAGEMENT	CO1: Apply the appropriate forecasting techniques & Aggregate planning methods
				CO2: Learn Materials management analysis and scheduling policies
				CO3: Learn about the inventory control techniques, MRP and contemporary management techniques.
				CO4: Apply quality management principles proposed by Taguachi, Juran & Demigs
				CO5: Apply optimization to LP model & transportation and assignment problems
44	IV-I	HSC-3	Universal Human Values: Understanding Harmony	CO1: Understanding the role of humans in society and nature
				CO2: Developing a holistic perspective
				CO3: Applying knowledge in different areas
45	IV-I	SOC-5	Mechatronics Lab	CO1: Develop PLC programs for control of traffic lights, water level, lifts and conveyor belts.
				CO2: Simulate and analyze PID controllers for a physical system using MATLAB.
				CO3: Develop pneumatic and hydraulic circuits using Automaton studio.
46	IV-II	PROJ	Project work	CO1: Demonstrate a sound technical knowledge of their selected project topic.
				CO2: Design engineering solutions to complex problems utilizing a systems approach
				CO3: Communicate with engineers and the community at large in written an oral form.

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