

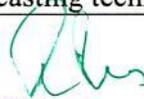


**BRILLIANT GRAMMAR SCHOOL EDUCATIONAL SOCIETY'S  
GROUP OF INSTITUTIONS-INTEGRATED CAMPUS**

(Approved by A.I.C.T.E & P.C.I, New Delhi, Affiliated to JNTUH, Hyderabad)  
Abdullapur (V), Abdullapurmet (M), R.R Dt. Hyderabad – 501505  
website: www.bgiic.ac.in, E-mail : principal@bgiic.ac.in, principal.7q@gmail.com Cell:9442263457

**MECHANICAL ENGINEERING I and II Course Outcomes for the Academic Year 2021-2022**

S.NO.	YEAR/SEM	COURSE NAME	Course Outcomes
1	II/I	METALLURGY AND MATERIAL SCIENCE	CO1: Identify the properties of metals with respect to crystal structure and grain size
			CO2: Interpret the phase diagrams of materials
			CO3: Classify and Distinguish different types of cast irons, steels and non ferrous alloys
			CO4: Describe the concept of heat treatment of steels & strengthening mechanisms
			CO5: Explain the powder metallurgy process, types and manufacturing of composite materials
2	II/I	MECHANICS OF SOLIDS	CO1: Understand the concepts of stress and strain and evaluate
			CO2: Apply the concept of shear force and bending moment for simple structural problems
			CO3: Apply the concepts of principal stresses and strains, body subjected to direct stresses accompanied by shear stresses
			CO4: Evaluate bending stresses and shear stresses for simple structures
			CO5: Analyze thin cylinders subjected to various stresses
			CO6: Evaluate stresses in shafts.
3	II/I	THERMODYNAMICS	CO1: Understand and differentiate between different thermodynamic system and process
			CO2: Understand and apply the laws of thermodynamics to different types of systems.
			CO3: Undergoing various processes and to perform thermodynamic analysis.
			CO4: Understand and analyze the thermodynamic cycle.
			CO5: Understand and evaluate performance parameters.
			CO6: Develop the concept of power cycle with description and representation on p-v and T-S diagram
4	II/I	PRODUCTION TECHNOLOGY	CO1: Elaborate the fundamentals of various moulding casting techniques and furnaces.

  
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			<p><b>CO2:</b> Identify the importance of permanent joining and principle behind different welding processes</p> <p><b>CO3:</b> Explain the concepts of solid-state welding processes</p> <p><b>CO4:</b> Understand the concepts of rolling and sheet metal operations in metal working.</p> <p><b>CO5:</b> Elaborates the uniqueness of extrusion, forging and high energy rate forming processes in metal working.</p> <p><b>CO6:</b> Develop process-maps for metal forming process using plasticity principles and identify the effect of process variable to manufacturing defect free products.</p>
5	II/I	<b>MACHINE DRAWING PRACTICE</b>	<p><b>CO1:</b> Preparation of engineering and working drawings with dimensions and bill of material during design and development. Developing assembly drawings using part drawings of machine components</p> <p><b>CO2:</b> Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.</p> <p><b>CO3:</b> Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.</p> <p><b>CO4:</b> Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.</p> <p><b>CO5:</b> Title boxes, their size, location and details - common abbreviations and their liberal usage.</p> <p><b>CO6:</b> Types of Drawings – working drawings for machine parts.</p>
6	II/I	<b>PROBABILITY AND STATISTICS &amp; COMPLEX VARIABLE</b>	<p><b>CO1:</b> Formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.</p> <p><b>CO2:</b> analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems</p> <p><b>CO3:</b> Taylor's and Laurent 'series expansions of complex function</p> <p><b>CO4:</b> Evaluate the integrals using Cauchy's integral formula and residue theorems.</p>

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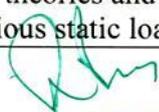


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			<b>CO5:</b> Solve the problems involving random variables.
7	III/I	<b>DYNAMICS OF MACHINERY</b>	<b>CO1:</b> Apply the knowledge of the gyroscopic effect and evaluate the stability of Ship, Aero plane, Two wheeler and Four wheeler.
			<b>CO2:</b> Understand the concept of Equilibrium of a body subjected to static and dynamic forces
			<b>CO3:</b> Analyze the concept of fluctuation energy, inertia of connecting rod- inertia force in reciprocating engines
			<b>CO4:</b> Develop the ability to identify a problem and apply the fundamental concepts of transmission and concepts of friction
			<b>CO5:</b> Understand the significance of governors and balancing of masses in various machines where ever applicable
			<b>CO6:</b> Develop the ability to function on multi-disciplinary teams by having knowledge of vibrations
8	III/I	<b>THERMAL ENGINEERING - II</b>	<b>CO1:</b> Develop state – space diagrams based on the schematic diagrams of process flow of steam and gas turbine plants
			<b>CO2:</b> Apply the laws of Thermodynamics to analyze thermodynamic cycles
			<b>CO3:</b> Differentiate between vapour power cycles and gas power cycles
			<b>CO4:</b> Infer from property charts and tables and to apply the data for the evaluation of performance parameters of the steam and gas turbine plants
			<b>CO5:</b> Understand the functionality of major components of steam and gas turbine plants and to do the analysis of these components
9	III/I	<b>DESIGN OF MACHINE MEMBERS-I</b>	<b>CO1:</b> The student acquires the knowledge about the principles of design, material selection, component behavior subjected to loads, design on the basis of strength & rigidity, and analyze the stresses & strains induced in a machine element
			<b>CO2:</b> Understands the concepts of principal stresses, Failure theories and design of components subjected to various static loads

  
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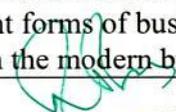
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			<p><b>CO3:</b> Student can able to design the machine components subjected to various varying &amp; reversal loadings considering stress concentration in machine members</p> <p><b>CO4:</b> Students will able to design the joints such as Bolted, Welded and Riveted Joints used in industrial Applications</p> <p><b>CO5:</b> Students can design various keys used in Power Transmission Applications and also they can able to design various Cotter and Knuckle Joints</p> <p><b>CO6:</b> Students can able to design the shafts and their couplings used in Industrial Power Transmission Applications</p>
10	III/I	<b>METROLOGY AND MACHINE TOOLS</b>	<p><b>CO1:</b> Identify techniques to minimize the errors in measurement.</p> <p><b>CO2:</b> Identify methods and devices for measurement of length, angle, and gear &amp; thread parameters, surface roughness and geometric features of parts.</p> <p><b>CO3:</b> Understand working of lathe, shaper, and planer, drilling, milling and grinding machines.</p> <p><b>CO4:</b> Comprehend speed and feed mechanisms of machine tools</p> <p><b>CO5:</b> Estimate machining times for machining operations on machine tools</p>
11	III/I	<b>BUSINESS ECONOMICS AND FINANCIAL ANALYSIS</b>	<p><b>CO1:</b> Understand the elasticity of the demand of the product, different types, and measurement of elasticity of demand and factors influencing on elasticity of demand.</p> <p><b>CO2:</b> Recognize the Production function, features of Iso-Quants and Iso-Costs, different types of internal economies, external economies and law of returns with appropriate examples.</p> <p><b>CO3:</b> Illustrate the features, merits and demerits of different forms of business organizations existing in the modern business.</p>

  
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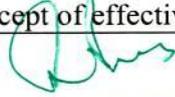
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			<p><b>CO4:</b> Enumerate the concept of capital budgeting and allocations of the resources through capital budgeting methods and compute simple problems for project management.</p> <p><b>CO5:</b> Evaluate different types of financial ratios for knowing liquidity and profitability positions of business concern.</p>
12	III/I	<b>OPERATIONS RESEARCH</b>	<p><b>CO1:</b> Identify and develop operational research models from the verbal description of the real system.</p> <p><b>CO2:</b> Understand the mathematical tools that are needed to solve optimization problems.</p> <p><b>CO3:</b> Use mathematical software to solve the proposed models.</p> <p><b>CO4:</b> Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.</p> <p><b>CO5:</b> Linear programming: solving methods, duality, and sensitivity analysis.</p>
13	IV/I	<b>POWER PLANT ENGINEERING</b>	<p><b>CO1:</b> Able to get the basics of Power Plants.</p> <p><b>CO2:</b> Able to get the idea about the power generation by renewable and non-renewable energy resources.</p> <p><b>CO3:</b> Able to know about the different types of cycles and natural resources used in power plants and their applications.</p>
14	IV/I	<b>REFRIGERATION AND AIR CONDITIONING</b>	<p><b>CO1:</b> Analyze the reversed Carnot cycle and vapour compression refrigeration cycle (VCR).</p> <p><b>CO2:</b> Select the air-refrigeration systems for aircraft, and vapour absorption refrigeration system for rural and remote areas and select environmental friendly refrigerants considering the international standards.</p> <p><b>CO3:</b> Identify the Psychometric processes for different applications and design the parameters of air-conditioning system as per standards.</p> <p><b>CO4:</b> Understand the human comfort, ASHRAE chart and concept of effective temperature</p>

  
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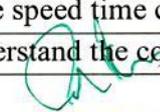


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			<b>CO5:</b> Estimate cooling load and heating load considering human comfort and optimize the air conditioning system as per requirements.
15	IV/I	MEMS	<b>CO1:</b> Students will be able to understand working principles of currently available micro sensors, actuators, and motors, valves, pumps, and fluidics used in Microsystems.
			<b>CO2:</b> Students will be able to apply scaling laws that are used extensively in the conceptual design of micro devices and systems. Students will be able to differentiate between the positive and negative consequences of scaling down certain physical quantities that are pertinent to Microsystems.
			<b>CO3:</b> Students will be able to use materials for common micro components and devices.
			<b>CO4:</b> Students will be able to choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process.
			<b>CO5:</b> Students will be able to consider recent advancements in the field of MEMS and devices
			<b>CO6:</b> Students will be able communicate their results and findings orally via formal presentations and in writing through reports.
			16
<b>CO2:</b> governing laws. distribution of fluid power, Design and analysis of typical hydraulic circuits			
<b>CO3:</b> Know accessories used in fluid power system, Filtration systems			
<b>CO4:</b> maintenance of system.			
<b>CO5:</b> Under Stand the maintenance of the pneumatic system.			
17	IV/I	UTILIZATION OF ELECTRICAL ENERGY	<b>CO1:</b> Understand basic principles of electric heating and welding.
			<b>CO2:</b> Determine the lighting requirements for flood lighting, household and industrial needs.
			<b>CO3:</b> Calculate heat developed in induction furnace.
			<b>CO4:</b> Evaluate speed time curves for traction
			<b>CO5:</b> To understand the concepts of electric drives

  
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18	II/II	<b>KINEMATICS OF MACHINERY</b>	<p>and their application to electrical traction systems.</p> <p><b>CO1:</b> Understand the various elements in mechanism and the inversions of commonly used mechanisms such as four bar, slider crank and double slider crank mechanisms</p> <p><b>CO2:</b> Draw the velocity and acceleration polygons for a given configuration of a mechanism.</p> <p><b>CO3:</b> Mechanical Engineering we come across number of mechanisms such as four bar/slider crank/double slider crank/straight line motion mechanism etc.</p> <p><b>CO4:</b> Once we make a study considering for us also there it is called kinetics. The first course deals with mechanisms, their inversions straight line motion mechanisms steering mechanisms etc.</p> <p><b>CO5:</b> Also study of cams/gears &amp; gear trains &amp; belts are also introduced.</p> <p><b>CO6:</b> The main purpose is to give an idea about the relative motions obtained in all the above type of components used in mechanical Engineering.</p>
19	II/II	<b>FLUID MECHANICS AND HYDRAULIC MACHINES</b>	<p><b>CO1:</b> Able to explain the effect of fluid properties on a flow system.</p> <p><b>CO2:</b> Able to identify type of fluid flow patterns and describe continuity equation.</p> <p><b>CO3:</b> To analyze a variety of practical fluid flow and measuring devices and utilize Fluid Mechanics principles in design.</p> <p><b>CO4:</b> To select and analyze an appropriate turbine with reference to given situation in power plants</p> <p><b>CO5:</b> To estimate performance parameters of a given Centrifugal and Reciprocating pump.</p> <p><b>CO6:</b> To estimate performance parameters of a given Centrifugal and Reciprocating pump.</p>
20	II/II	<b>INSTRUMENTATION AND CONTROL SYSTEMS</b>	<p><b>CO1:</b> To identify various elements and their purpose in typical instruments, to identify various errors that would occur in instruments</p> <p><b>CO2:</b> Analysis of errors so as to determine correction factors for each instrument.</p> <p><b>CO3:</b> To understand static and dynamic characteristics of instrument and should be able to determine loading response time.</p>

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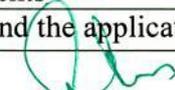


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			<p><b>CO4:</b> For given range of displacement should be able to specify transducer, its accurate and loading time of that transducer.</p> <p><b>CO5:</b> Identifying properties used for evaluating the thermal systems.</p> <p><b>CO6:</b> Identifying errors and their types that would occur in an instrument.</p>
21	II/II	<b>THERMAL ENGINEERING – I</b>	<p><b>CO1:</b> the student should be able to evaluate the performance of IC engines and compressors under the given operating conditions</p> <p><b>CO2:</b> Apply the laws of Thermodynamics to evaluate the performance of Refrigeration and air-conditioning cycles.</p> <p><b>CO3:</b> Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance</p> <p><b>CO4:</b> The functionality of the major components of the IC engine</p> <p><b>CO5:</b> evaluate the performance analysis of the major components and systems of IC engines, refrigeration cycles and their applications.</p>
22	II/II	<b>BASIC ELECTRICAL AND ELECTRONICS ENGINEERING</b>	<p><b>CO1:</b> To analyze and solve electrical circuits using network laws and theorems</p> <p><b>CO2:</b> To understand and analyze basic Electric and Magnetic circuits</p> <p><b>CO3:</b> To study the working principles of Electrical Machines</p> <p><b>CO4:</b> To introduce components of Low Voltage Electrical Installations</p> <p><b>CO5:</b> To identify and characterize diodes and various types of transistors.</p> <p><b>CO6:</b></p>
23	III/II	<b>CAD &amp; CAM</b>	<p><b>CO1:</b> Understand geometric transformation techniques in CAD</p> <p><b>CO2:</b> Develop mathematical models to represent curves and surfaces. Model engineering components using solid modeling techniques.</p> <p><b>CO3:</b> Develop programs for CNC to manufacture industrial components</p> <p><b>CO4:</b> To understand the application of computers</p>

  
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			in various aspects of Manufacturing.
			<b>CO5:</b> Design, Proper planning, Manufacturing cost, Layout & Material Handling system.
24	III/II	<b>HEAT TRANSFER</b>	<b>CO1:</b> Understand the basic modes of heat transfer
			<b>CO2:</b> Compute one dimensional steady state heat transfer with and without heat generation
			<b>CO3:</b> Understand and analyze heat transfer through extended surfaces
			<b>CO4:</b> Interpret and analyze forced and free convective heat transfer
			<b>CO5:</b> Understand the principles of boiling, condensation and radiation heat transfer
			<b>CO6:</b> Design of heat exchangers using LMTD and NTU methods
25	III/II	<b>UNCONVENTIONAL MACHINING PROCESSES</b>	<b>CO1:</b> Understand the basic techniques of Unconventional Machining processes modeling
			<b>CO2:</b> To teach the modeling technique for machining processes
			<b>CO3:</b> To teach the mechanics and thermal issues associated with chip formation
			<b>CO4:</b> To teach the effects of tool geometry on machining force components and surface finish
			<b>CO5:</b> To teach the machining surface finish and material removal rate
			<b>CO6:</b> Estimate the material removal rate and cutting force, in an industrially useful manner, for Unconventional Machining processes.
26	III/II	<b>FINITE ELEMENT METHODS</b>	<b>CO1:</b> At the end of the course, the student will be able to, Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer.
			<b>CO2:</b> Formulate and solve problems in one dimensional structures including trusses, beams and frames.
			<b>CO3:</b> Formulate FE characteristic equations for two dimensional elements and analyze plain stress, plain strain, axi-symmetric and plate bending problems. ANSYS, ABAQUS, NASTRAN, etc.
			<b>CO4:</b> Implementation of material model in finite element method and applications

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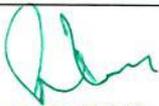
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			<b>CO5:</b> Importance of interfaces and joints on the behavior of engineering systems
27	III/II	<b>DESIGN OF MACHINE MEMBERS-II</b>	<b>CO1:</b> Ability to use Standard Design Data Book and knowledge about journal bearing design
			<b>CO2:</b> Estimation of life of rolling element bearings and their selection for given service conditions
			<b>CO3:</b> Knowledge of design of Internal Combustion Engine Components
			<b>CO4:</b> Student can able to design different belt drives, pulleys & various springs used in industrial and Automobile Applications
			<b>CO5:</b> Ability to design Spur gears used in Industrial & Automotive Applications
			<b>CO6:</b> Knowledge of design of Helical gears used in Industrial & Automotive Applications
28	III/II	<b>DISASTER MANAGEMENT</b>	<b>CO1:</b> To Understand basic concepts in Disaster Management
			<b>CO2:</b> To Understand Definitions and Terminologies used in Disaster Management
			<b>CO3:</b> To Understand Types and Categories of Disasters.
			<b>CO4:</b> To Understand the Challenges posed by Disasters.
			<b>CO5:</b> To understand Impacts of Disasters Key Skills.
			<b>CO6:</b>
29	IV/II	<b>BASIC POWER PLANT ENGINEERING</b>	<b>CO1:</b> To understand Basic Rankine cycle and its modifications, layout of modern coal power plant, super critical boilers
			<b>CO2:</b> To understand FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration systems
			<b>CO3:</b> Explain Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.
			<b>CO4:</b> Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor,

  
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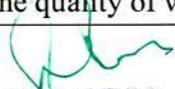
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			<p>Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants.</p> <p><b>CO5:</b> To understand Power tariffs, load distribution parameters, load curve, capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.</p>
30	IV/II	<b>INDUSTRIAL ROBOTICS</b>	<p><b>CO1:</b> the student will be able to understand the basic components of robots.</p> <p><b>CO2:</b> Differentiate types of robots and robot grippers. Model forward and inverse kinematics of robot manipulators.</p> <p><b>CO3:</b> Analyze forces in links and joints of a robot. Programme a robot to perform tasks in industrial applications.</p> <p><b>CO4:</b> Design intelligent robots using sensors.</p> <p><b>CO5:</b> Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.</p> <p><b>CO6:</b> The goal of the course is to familiarize the students with the concepts and techniques in robotic engineering, manipulator kinematics, dynamics and control, chose, and incorporate robotic technology in engineering systems.</p>
31	IV/II	<b>INDUSTRIAL MANAGEMENT</b>	<p><b>CO1:</b>Able to apply techniques for plant location, design plant layout and value analysis</p> <p><b>CO2:</b>Able to carry out work study to find the best method for doing the work and establish standard time for a given method</p> <p><b>CO3:</b>Able to apply various quality control techniques and sampling plans</p> <p><b>CO4:</b> Able to do job evaluation and network analysis.</p> <p><b>CO5:</b>Able to design the organization structure</p>
32	II/I	<b>PRODUCTION TECHNOLOGY LAB</b>	<p><b>CO1:</b> Understanding the properties of moulding sands and pattern making.</p> <p><b>CO2:</b> Fabricate joints using gas welding and arc welding.</p> <p><b>CO3:</b> Evaluate the quality of welded joints.</p>

  
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 R.R. Dist-501505.



**BRILLIANT GRAMMAR SCHOOL EDUCATIONAL SOCIETY'S  
GROUP OF INSTITUTIONS-INTEGRATED CAMPUS**

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			CO4: Basic idea of press working tools and performs moulding studies on plastics.
33	II/I	MATERIAL SCIENCE & MECHANICS OF SOLIDS LAB	CO1: The Primary focus of the MMS program is to provide undergraduates with a fundamental knowledge based associated materials properties, and their selection and application CO2: Upon graduation, students would have acquired and developed the necessary background and skills for successful careers in the materials-related industries CO3: Furthermore, after completing the program, the student should be well prepared for management positions in industry or continued education toward a graduate degree.
34	III/I	THERMAL ENGINEERING LAB	CO1: Measure thermo-physical properties of solid, liquid and gaseous fuels. CO2: Identify various systems and subsystems of Diesel and petrol engines CO3: Analyze the performance characteristics of internal combustion engines CO4: Interpret the performance characteristics of air compressors CO5: Able to understand different types of boilers
35	III/I	METROLOGY & MACHINE TOOLS LAB	CO1: Apply the procedures to measure length, angles, width, depth, bore diameters, internal and external tapers, tool angles, and surface roughness by using different instruments and by different indirect methods CO2: Use effective methods of measuring straightness, Squareness, flatness, roundness, profile, screw threads and gear teeth. CO3: Able to understand various types of machines, tools and their operations. CO4: Able to perform various types of machining operations.
36	III/I	KINEMATICS & DYNAMICS LAB	CO1: Upon successful completion of this lab, students should be able to: Understand types of motion• CO2: Analyze forces and torques of components in linkages CO3: Understand static and dynamic balance

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			<b>CO4:</b> Understand forward and inverse kinematics of open-loop mechanisms
37	II/II	<b>BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB</b>	<b>CO1:</b> To analyze and solve electrical circuits using network laws and theorems. <b>CO2:</b> To understand and analyze basic Electric and Magnetic circuits <b>CO3:</b> To study the working principles of Electrical Machines <b>CO4:</b> To introduce components of Low Voltage Electrical Installations <b>CO5:</b> To identify and characterize diodes and various types of transistors.
38	II/II	<b>FLUID MECHANICS AND HYDRAULIC MACHINES LAB</b>	<b>CO1:</b> Able to explain the effect of fluid properties on a flow system <b>CO2:</b> Able to identify type of fluid flow patterns and describe continuity equation. <b>CO3:</b> To analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design. <b>CO4:</b> To select and analyze an appropriate turbine with reference to given situation in power plants. <b>CO5:</b> To estimate performance parameters of a given Centrifugal and Reciprocating pump. <b>CO6:</b> Able to demonstrate boundary layer concepts
39	II/II	<b>INSTRUMENTATION AND CONTROL SYSTEMS LAB</b>	<b>CO1:</b> At the end of the course, the student will be able to Characterize and calibrate measuring devices. <b>CO2:</b> Identify and analyze errors in measurement. Analyze measured data using regression analysis. <b>CO3:</b> Calibration of Pressure Gauges, temperature, LVDT, capacitive transducer, rotameter.
40	III/II	<b>HEAT TRANSFER LAB</b>	<b>CO1:</b> Perform steady state conduction experiments to estimate thermal conductivity of different materials. <b>CO2:</b> Perform transient heat conduction experiment. <b>CO3:</b> Estimate heat transfer coefficients in forced convection, free convection, condensation and correlate with theoretical values. <b>CO4:</b> Obtain variation of temperature along the

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			length of the pin fin under forced and free convection.
			<b>CO5:</b> Perform radiation experiments: Determine surface emissivity of a test plate and Stefan Boltzmann's constant and compare with theoretical value.
<b>41</b>	<b>III/II</b>	<b>CAD &amp; CAM LAB</b>	<b>CO1:</b> To understand the analysis of various aspects in of manufacturing design.
			<b>CO2:</b> To understand and able use different Designing and Analysis software's.
			<b>CO3:</b> Able to create programming by making use of programming languages of CAM.
<b>42</b>	<b>III/II</b>	<b>ADVANCED COMMUNICATION SKILLS LAB</b>	<b>CO1:</b> Able to speak fluently.
			<b>CO2:</b> Able to take part in Social and Professional Communication.
			<b>CO3:</b> Able to communicate their ideas relevantly and coherently in writing.

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