



P. S. G. V. P. Mandal's
D. N. Patel College of Engineering, Shahada
Department of Mechanical Engineering

Course Outcomes (CO): ENGINEERING GRAPHICS

CO1	Use of drawing instruments effectively for drawing and dimensioning
CO2	Explain conventions and methods of engineering drawing
CO3	Apply concepts of projections of points, lines, planes, solids and section of solids
CO4	Construct isometric and orthographic views of given objects



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Course Outcomes (CO) – Energy and Environment Engineering

CO1	Identify conventional, non conventional energy sources.
CO2	Know and discuss power consuming and power developing devices for effective utilization and power consumption
CO3	Identify various sources of air, water pollution and its effects.
CO4	Know and discuss noise, soil, thermal pollution and Identify solid, biomedical and hazardous waste.



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Course Outcomes (CO) – BCME

CO1	Identify conventional, non conventional energy sources.
CO2	An ability to identify, formulate and solve engineering problems
CO3	Understand the energy sources and working principle of power plants and apply the knowledge of power plants to diagnose and solve the Engineering problem.
CO4	. Understand the working principle of IC Engines.



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Course Outcomes (CO)-Engineering Graphics Lab

Course Description:

This course is aimed at introducing the basic of AutoCAD and its application to engineering drawing. It also aims to study engineering drawing instruments, conventions used, method of projections. The concept of projection of point, line, plane, and solid, section of solid, orthographic projection and isometric projection is studied.

At the end of this course, students should be able to

CO1	To know about the software AutoCAD.
CO2	Use of AutoCAD for geometric construction.
CO3	To know the concept of projections of points, lines on AutoCAD.
CO4	To understand the Construction isometric and orthographic on AutoCAD.



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Course Outcomes (CO)-W.S. Practice.

C01	Build thorough knowledge of various tools, machines, devices used in engineering practice.
C02	Acquire thorough knowledge of carrying out various operations in mechanical engineering workshop
C03	Utilize measuring skills gained in workshop practice
C04	Acquire “Hands on” training and practice to students for use of various tools, devices and machines.



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Course Outcomes (CO) – Fluid Mechanics

CO1	Define fluid, define and calculate various properties of fluid
CO2	Calculate hydrostatic forces on the plane and curved surfaces and explain stability of floating bodies
CO3	Explain various types of flow. Calculate acceleration of fluid particles
CO4	Apply Bernoulli's equation to simple problems in fluid mechanics
CO5	Explain laminar and turbulent flows on flat plates and through pipes
CO6	Explain and use dimensional analysis to simple problems in fluid mechanics
CO7	Understand centrifugal pump.



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Course Outcomes (CO) – Material Science & Metallurgy

CO1	Study various crystal structures of materials.
CO2	Understand mechanical properties of materials and calculations of same using appropriate equations
CO3	Evaluate phase diagrams of various materials
CO4	Suggest appropriate heat treatment process for a given application
CO5	Prepare samples of different materials for metallography.
CO6	Recommend appropriate NDT technique for a given application
CO7	Study various Micro Structure of Steel, Cast iron.



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Course Outcomes (CO)-Thermodynamics

Course Description:

This course is aimed at introducing the fundamentals of thermodynamics such as first law of thermodynamic, second law of thermodynamics, entropy and pure substances.

At the end of this course, students should be able to

CO1	Define the terms like system, boundary, properties, equilibrium, work, heat, ideal gas, entropy etc. used in thermodynamics.
CO2	Study different laws of thermodynamics and apply these to simple thermal systems like balloon, piston-cylinder arrangement, compressor, pump, refrigerator, heat exchanger, etc. to study energy balance.
CO3	Study various types of processes like isothermal, adiabatic, etc. considering system with ideal gas and represent them on p-v and T-s planes.
CO4	Apply availability concept to non-flow and steady flow type systems.
CO5	Represent phase diagram of pure substance (steam) on different thermodynamic planes like p-v, T-s, h-s, etc. Show various constant property lines on them.



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Course Outcomes (CO) – M.D.CAD LAB (S.Y.)

CO1	Interpret the object with the help of given sectional and orthographic views .
CO2	Draw sectional view of a given machine component.
CO3	Draw machine element using keys, cotter, knuckle, bolted and welded joint .
CO4	Assemble details of any given part. i. e. valve, pump , machine tool part etc..
CO5	Represent tolerances and level of surface finish on production drawings .
CO6	Understand various creating and editing commands in Auto Cad .



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COURSE OUTCOMES (CO) – FLUID MECHANICS LAB

CO1	Understand laminar and Turbulent flow and determine Critical Reynolds number using Reynolds Apparatus
CO2	Verify Bernoulli's theorem
CO3	Determine pressure drop in flow through pipes and pipe fittings
CO4	Verify momentum equation using impact of jet apparatus
CO5	Determine viscosity using viscometer
CO6	Do calibration of pressure gauges, rotameter
CO7	Use manometers for pressure measurement



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Course Outcomes (CO) – Material Science & Metallurgy Lab

CO1	To Find out Brinell Hardness Number of various Material.
CO2	To Find out Hardness Number Using Rockwell Hardness test .
CO3	Find out crack ,Porosity ,Voids Using Magnaflux Test .
CO4	Student able to find crack ,Porosity Using Dye Penetrant Test
CO5	Student able to Prepare Specimen for Microscopy
CO6	Student can Study and drawing of microstructures of plain carbon steels of varying carbon percentage
CO7	Student can Study and drawing of microstructures of cast irons



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Course Outcomes (CO)-Theory of Machines-I

Course Description:

This course is aimed at introducing the fundamentals of kinematics of mechanisms. The objective of the course is to use the knowledge of inversions of mechanisms & its application in machines.

At the end of this course, students should be able to

CO1	Define basic terminology of kinematics of mechanisms
CO2	Classify planar mechanisms and calculate its degree of freedom
CO3	Perform kinematic analysis of a given mechanism using ICR and RV methods
CO4	Perform kinematic analysis of a given mechanism analytically using vector or complex algebra method
CO5	Perform kinematic analysis of slider crank mechanism using Klein's construction and analytical approach



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Course Outcomes (CO)-Basic Human Rights

Course Description:

This course is aimed at introducing the history of human rights. It also gives information about the various laws related to human right, migrant workers, social justice, education. In addition to this the subject covers various aspects such as social structure, responsibility, environmental issues. At the end of this course, students should be able to

CO1	Understand the history of human rights.
CO2	Learn to respect others caste, religion, region and culture.
CO3	Be aware of their rights as Indian citizen.
CO1	Understand the history of human rights.
CO2	Learn to respect others caste, religion, region and culture.
CO3	Be aware of their rights as Indian citizen.



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Course Outcomes (CO) – Manufacturing Processes I

CO1	Analyze and access the use of casting processes in manufacturing and understand the working of various casting processes
CO2	Understand the basics of metal cutting and working of different types of machine tools.
CO3	Explain the conventional and advanced metal forming processes and composite fabrication
CO4	Analyze and access the importance of welding processes in manufacturing and apply knowledge to select appropriate welding process based on the type of industrial application
CO5	Upon completion of this course, the students can able to apply the different metal removing ,finishing and super finishing and for component production
CO6	Demonstrate operation such as Turning, Facing, Threading, Knurling and Grooving on Centre Lathe.
CO7	Select appropriate Manufacturing Processing to manufacture any component.
CO8	Implement the Knowledge of Gained Subject in Industry



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Course Outcomes (CO) – Sheet Metal Engineering. (S.Y.)

CO1	Recognize common manufacturing processes of Sheet Metal Fabrication
CO2	Understand the principles of design and fabricate of sheet metal products and recognize common material used in the industry
CO3	Distinguish Shearing, Drawing and Pressing etc. processes
CO4	Know types of dies and formability
CO5	Select mechanical or hydraulic presses for the given process



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Course Outcomes (CO) – Strength of Materials

CO1	State the basic definitions of fundamental terms such as axial load, eccentric load, stress, strain, E, μ , etc
CO2	Recognize the stress state (tension, compression, bending, shear, etc.) and calculate the value of stress developed in the component in axial/eccentric static and impact load cases.
CO3	Distinguish between uniaxial and multiaxial stress situation and calculate principal stresses, max. Shear stress, their planes and max. Normal and shear stresses on a given plane.
CO4	Analyze given beam for calculations of SF and BM
CO5	Calculate slope and deflection at a point on cantilever /simply supported beam using double integration, Macaulay's , Area-moment and superposition methods



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Course Outcomes (CO)-Theory of Machines Lab-I (S.Y.)

Course Description:

This course is aimed at demonstrating basic mechanisms and analysis of mechanisms.

At the end of this course, students should be able to

CO1	Perform graphically kinematic analysis of any planar mechanism using ICR and RV methods.
CO2	Perform graphically kinematic analysis of slider crank mechanism using Klein's construction.
CO3	Demonstrate use of graphical differentiation method for kinematic analysis of slider crank mechanism or any other planar mechanism with a slider.
CO4	Sketch polar diagram for a Hooke's joint.



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Course Outcomes (CO)-MP I Lab

C01	Know the various basic Manufacturing processes used in industry for converting raw materials into finished products.
C02	Know the principles and science of various basic manufacturing processes
C03	Acquire fundamental knowledge and design widely used and very important primary manufacturing processes such as casting, joining and forming.
C04	Acquire knowledge about the various tools, equipment, machinery and operations required for these basic manufacturing processes.



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Course Outcomes (CO)- S.O.M. Lab.

CO1	Evaluate Properties of material by impact test.
CO2	Evaluate Properties of material by hardness test
CO3	Evaluate Properties of material by tensile test.
CO4	Evaluate the capacity of a material to withstand torsional stresses for a safe and sustainable design of machine elements.



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Course Outcomes (CO)-Automobile Engineering Sem-I 22-23

Course Description:

- ✓ This course is aimed at introducing the fundamentals of Automobile Engineering to undergraduate students. The objective of the course is to use the Knowledge of Automobile in real life applications. Classroom and Lab sessions focuses on writing efficient, maintainable, and portable code.

At the end of this course, students should be able to

C01	Identify the different parts of the automobile.
C02	Explain the working of various parts like engine, transmission, clutch, brakes etc.,
C03	Demonstrate various types of drive systems.
C04	Apply vehicle troubleshooting and maintenance procedures.
C05	Analyze the environmental implications of automobile emissions. And suggest suitable regulatory modifications.
C06	Evaluate future developments in the automobile technology.



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Course Outcomes (CO)-Theory of Machines-II (T.Y.)

Course Description:

This course is aimed at introducing the fundamentals of machines & mechanisms. The objective of the course is to use the knowledge of concepts of gear, belt, chain, governor, gyroscope, flywheels and vibration reduction in real life applications such as aeroplanes, ships, machines etc.

At the end of this course, students should be able to

CO1	Identify and select type of belt and rope drive for a particular application
CO2	Evaluate gear tooth geometry and select appropriate gears, gear trains
CO3	Define governor and select/suggest an appropriate governor
CO4	Characterize flywheels as per engine requirement
CO5	Understand gyroscopic effects in ships, aeroplanes, and road vehicles.
CO6	Understand free and forced vibrations of single degree freedom systems



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Course Outcomes (CO) – R.E.S. (T.Y.)

CO1	Explain the difference between renewable and non renewable energy.
CO2	Describe working of solar collectors.
CO3	Explain various applications of solar energy.
CO4	Describe working of other renewable energies such as wind, biomass
CO5	Understand the concept of other renewable energy sources like Tidal energy, Geo thermal energy, OTCE, Nuclear energy and Hydro-electric energy.



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Course Outcomes (CO) – Heat Transfer

CO1	Explain the laws of heat transfer and deduce the general heat conduction equation and to explain it for 1-D steady state heat transfer in regular shape bodies
CO2	Describe the critical radius of insulation, overall heat transfer coefficient, thermal conductivity and lumped heat transfer
CO3	Interpret the extended surfaces
CO4	Illustrate the boundary layer concept, dimensional analysis, forced and free convection under different conditions
CO5	Describe the Boiling heat transfer, Evaluate the heat exchanger and examine the LMTD and NTU methods applied to engineering problems
CO6	Explain the thermal radiation black body, emissivity and reflectivity and evaluation of view factor and radiation shields



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Course Outcomes (CO) –AT

CO1	Define the terms like calorific value of fuel, stoichiometric air-fuel ratio, excess air, equivalent evaporation, boiler efficiency, etc. Calculate minimum air required for combustion of fuel.
CO2	Study and Analyze gas power cycles and vapor power cycles like Joule cycle and Rankine cycle and derive expressions for the performance parameters like thermal efficiency, P_m
CO3	Classify various types of boilers, nozzle, steam turbine and condenser used in steam power plant.
CO4	Draw P-v diagram for single-stage reciprocating air compressor, with and without clearance volume, and evaluate its performance. Differentiate between reciprocating and rotary air compressors.



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Course Outcomes (CO)-Machine Design-I

Course Description:

- ✓ This course is aimed at introducing the fundamentals of Machine Design-I to undergraduate students. The objective of the course is to use the Knowledge of Machine Design in real life applications. Classroom and Lab sessions focus on writing efficient, maintainable, and portable code.

At the end of this course, students should be able to

C01	Formulate the problem by identifying customer need and convert into design specification
C02	Understand component behavior subjected to loads and identify failure criteria
C03	Analyze the stresses and strain induced in the component
C04	Design of machine component using theories of failures
C05	Design of component for finite life and infinite life when subjected to fluctuating load
C06	Design of components like shaft, key, coupling, screw and spring



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Course Outcomes (CO)-Theory of Machines Lab-II (T.Y.)

Course Description:

This course is aimed at demonstrating basic machine elements & mechanisms.

At the end of this course, students should be able to

CO1	Identify and select type of belt and rope drive for a particular application
CO2	Evaluate gear tooth geometry and select appropriate gears, gear trains
CO3	Define governor and select/suggest an appropriate governor
CO4	Characterize flywheels as per engine requirement



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Course Outcomes (CO)-Heat Transfer Lab

Course Description:

This course demonstrates the various heat transfer methods. It also demonstrates it through experiments and analysis of the data. At the end of the course, students will be able to-

CO1	Understand the various heat transfer mode of heat transfer and its application and verify
CO2	Learn the experimental methodology
CO3	Describe the concept the terms like least count, calibration of the instruments



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Course Outcomes (CO)- M.D - I Lab.

C01	To understand procedure of machine design and develop an ability to apply it for simple component design by using design data hand book
C02	To understand the different theories of failure and develop an ability to apply its knowledge for design of mechanical component and determine the resisting areas against failure.
C03	To determine forces on transmission shaft and design of transmission shaft
C04	To determine the endurance strength and design of components subjected to fluctuating loads
C05	To determine the forces in welds and riveted joints and formulate design solution for size of weld and size of rivet.



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Course Outcomes (CO)-Manufacturing Processes-II

Course Description:

This course is aimed at making the students aware about the different manufacturing processes. The course includes the basic principles & applications of abrasive machining, powder metallurgy, processing of ceramics, plastics & glass. It also imparts knowledge of theory of cutting tool, tool life, machinability.

CO1	Understand the process of powder metallurgy and its applications
CO2	Calculate the cutting forces in orthogonal and oblique cutting
CO3	Evaluate the machinability of materials
CO4	Understand the abrasive processes
CO5	Explain the different precision machining processes
CO6	Design jigs and fixtures for given application



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Course Outcomes (CO)-Machine Design-II SEM-II 22-23

Course Description:

- ✓ This course is aimed at introducing the fundamentals of Machine Design-II to undergraduate students. The objective of the course is to use the Knowledge of Machine Design in real life applications. Classroom and Lab sessions focus on writing efficient, maintainable, and portable code.

At the end of this course, students should be able to

C01	Define function of bearing and classify bearings.
C02	Understanding failure of bearing and their influence on its selection.
C03	Classify the friction clutches and brakes and decide the torque capacity and friction disk parameter.
C04	Select materials and configuration for machine element like gears, belts and chain
C05	Design of elements like gears, belts and chain for given power rating
C06	Design thickness of pressure vessel using thick and thin criteria



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Course Outcomes (CO) – Internal Combustion Engines

CO1	Understand various types of I.C. Engines and Cycles of operation.
CO2	Analyze the effect of various operating variables on engine performance
CO3	Identify fuel metering and fuel supply systems for different types of engines
CO4	Understand normal and abnormal combustion phenomena in SI and CI engines
CO5	Evaluate performance Analysis of IC Engine and Justify the suitability of IC Engine for different application
CO6	Understand the conventional and non-conventional fuels for IC engines and effects of emission formation of IC engines, its effects and the legislation standards



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Course Outcomes (CO) – Product life Cycle Management. (T.Y.)

CO1	Outline the concept of PLM.
CO2	Illustrate the PDM system and its importance
CO3	Illustrate the product design process
CO4	Build the procedure for new product development
CO5	Classify and compare various technology forecasting methods
CO6	Outline the stages involved in PLM for a given product



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Course Outcomes (CO) –QTPM

C01	Define and formulate research models to solve real life problems for allocating limited resources by linear programming.
C02	Apply transportation and assignment models to real life situations
C03	Apply queuing theory for performance evaluation of engineering and management systems.
C04	Apply the mathematical tool for decision making regarding replacement of items in real life.
C05	Determine the EOQ, ROP and safety stock for different inventory models.
C06	Construct a project network and apply CPM and PERT method



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Course Outcomes (CO)-Manufacturing Processes-II LAB

Course Description:

- ✓ This course is aimed at introducing the fundamentals of Manufacturing Processes to undergraduate students. The objective of the course is to use the Manufacturing Processes Knowledge in real life applications. Classroom and Lab sessions focus on writing efficient, maintainable, and portable code.

At the end of this course, students should be able to

C01	Upon Completion of this course the students can be able to understand & compare the functions & application of different metal cutting tools.
C02	Learn operations in metal cutting processes.
C03	To demonstrate the programming in CNC machining.
C04	Upon completion of this course the students can be able to apply the different metal removing, finishing for component production
C05	Learn various cutting tool operations using CNC Machine.
C06	Upon completion of this course the students can be able to understand & compare the process.



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Course Outcomes (CO)-Machine Design-II LAB sem-II 22-23

Course Description:

- ✓ This course is aimed at introducing the fundamentals of Machine Design-II to undergraduate students. The objective of the course is to use the Knowledge of Machine Design in real life applications. Classroom and Lab sessions focus on writing efficient, maintainable, and portable code.

At the end of this course, students should be able to

C01	Apply design process to an open ended problems.
C02	Determine suitable material and size for structural component of machine/system.
C03	Apply iterative technique in design including making estimate of unknown values for first computation and checking or revisiting and re-computing.
C04	Choose logically and defend selection of design factors.
C05	Design of components for given part/system i.e shaft, keys, coupling, links, screws, springs etc.
C06	Work effectively as a part of design group/team. Have good communication skill, orally, graphically as well as in writing.



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Course Outcomes (CO)- I.C. Engine Lab.

C01	Understand the practical operation of 2 stroke and 4 stroke I.C engines using valve timing diagram
C02	Analyze the performance of multi cylinder engines with the variation of various performances like load and speed.
C03	Determine the quality of Engine fuels by analyzing its calorific value
C04	Estimate the constituents of combustion products for emission characteristics related to public safety.
C05	Understand the concept of cooling Systems in I.C. Engine.



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Course Outcomes (CO) – Mechatronics

CO1	Define sensor, transducer and understand the applications of different sensors and transducers
CO2	Explain the signal conditioning and data representation techniques
CO3	Design pneumatic and hydraulic circuits for a given application
CO4	Write a PLC program using Ladder logic for a given application
CO5	Understand applications of microprocessor and micro controller
CO6	Analyse PI, PD and PID controllers for a given application



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Course Outcomes (CO)-CAD/CAM

Course Description:

This course is aimed at introducing the fundamentals of computer aided design and computer aided manufacturing.. The objective of the course is to use the knowledge of CAD/CAM in the design and manufacturing of products in real life applications.

At the end of this course, students should be able to

CO1	List and describe the various input and output devices for a CAD work station
CO2	Carry out/calculate the 2-D and 3-D transformation positions (Solve problems on 2-D and 3-D transformations)
CO3	Describe various CAD modeling techniques with their relative advantages and limitations
CO4	Describe various CAD modeling techniques with their relative advantages and limitations
CO5	Develop NC part program for the given component, and robotic tasks
CO6	Describe the basic Finite Element procedure
CO7	Explain various components of a typical FMS system, Robotics, and CIM
CO8	Classify parts in part families for GT
CO9	Describe and differentiate the CAPP systems



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Course Outcomes (CO)-Manufacturing Processes-III- Sem-I 22-23

Course Description:

- ✓ This course is aimed at introducing the fundamentals of Mechanical engineering to undergraduate students. The objective of the course is to use the Mechanical Engineering Knowledge in real life applications. Classroom and Lab sessions focus on writing efficient, maintainable, and portable code.

At the end of this course, students should be able to

C01	Differentiate clearly between NC and CNC machines
C02	Prepare and execute a part program for producing a given product
C03	Select appropriate non-traditional machining process for a given application
C04	Compare different surface coating techniques
C05	Explain different rapid prototyping techniques
C06	Illustrate the working principle of various micro-manufacturing processes



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Course Outcomes (CO) –R.A.C.

CO1	To understand the concept of refrigeration
CO2	Define various air properties and psychrometric processes
CO3	Explain various air conditioning systems.
CO4	Explain various air cooling systems.
CO5	To acquire knowledge of methods of refrigeration.



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Course Outcomes (CO) – Knowledge Management. (Final Year)

CO1	Gain the knowledge and skills relevant to a career as a professional engineering manager who can work effectively with current and future industrial technologies, methods and standards .
CO2	Students focuses on how Knowledge Management (KM) and a range of Information Technologies and analysis techniques are used to support KM initiatives in organisations
CO3	Students should develop analytical skills to understand the complexity of real-world KM work in organisations.
CO4	It promotes innovative thinking around the deployment of existing and emerging information technologies for KM.
CO5	The subject contributes to the development of independent critical inquiry, analysis and reflection.
CO6	Acquire understanding of the innovative and pioneering approaches in engineering management field and to be able to apply them to the solution of real-world problems to develop new industrially-relevant solutions
CO7	Be able to apply and integrate knowledge and understanding of other engineering and non-engineering disciplines to support engineering activities.



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Course Outcomes (CO) – Mechatronics Lab

CO1	Understand the various types of sensors and their applications
CO2	Design a pneumatic circuit for a given application
CO3	Design a hydraulic circuit for a given application
CO4	Write a PLC program using Ladder logic
CO5	Experiment PID controller for controlling temperature
CO6	Demonstrate the capacitance sensor for measuring level



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Course Outcomes (CO)-CAD/CAM Lab

Course Description:

This course is aimed at introducing the fundamentals of computer aided design and computer aided manufacturing. The objective of the course is to gain the knowledge of CAD software for the design engineering as well as instruction about CNC programming & application of robot.

At the end of this course, students should be able to

CO1	Construct CAD part models, assembly model and drafting of machine elements using CAD software.
CO2	Evaluate stresses in components subjected to simple structural loading using FE software
CO3	Write NC programs for turning and milling
CO4	Describe case study of industrial robots