

GOKULA KRISHNA COLLEGE OF ENGINEERING – SULLURPET

(Affiliated to JNTUA Ananthapuramu and approved by AICTE, New Delhi)

DEPARTMENT OF MECHANICAL ENGINEERING

Mechanical Engineering - Vision & Mission

VISION

To be recognized as a provider of high quality education in the field of Mechanical Engineering that enables graduates to meet the needs of society and to craft intellectually-adept research centers with world class competency and cutting edge proficiency.

MISSION

To educate, prepare and mentor students to excel as professionals.

To provide the facilities and environment conducive to high quality education to get diverse careers as well as research in the field of Mechanical Engineering.

To engage the students in academic as well as scholarly activities, which strengthen the department reputation in global market.

Program Outcomes (POs)

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.



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

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

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

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

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

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

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO 1: Ability to design manufacturing processes, products, the equipment, tooling and necessary environment for the manufacture of products that meet specific material and other requirements.

PSO 2: Ability to use design, manufacturing and industrial engineering software packages to formulate and solve real time issues.

PSO 3: Ability to analyze, synthesis and control manufacturing operations using statistical methods and to create competitive advantage through the application of manufacturing planning, strategy, quality and control concepts.

Course Objectives and Outcomes (COs)



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Course Name: Fluid Mechanics and Hydraulic Machines

Course Objectives:

- To impart ability to solve engineering problems in fluid mechanics
- To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
- To enable the students measure quantities of fluid flowing in pipes, tanks and channels
- To Introduce concepts of uniform and non-uniform flows through open channel.
- To impart knowledge on design of turbines and pumps.

Course Outcomes (CO):

- Familiarize basic terms used in fluid mechanics
- Understand the principles of fluid statics, kinematics and dynamics
- Understand flow characteristics and classify the flows and estimate various losses in flow through channels
- Analyze characteristics for uniform and non-uniform flows in open channels.
- Design different types of turbines, centrifugal and multistage pumps.

Course Name: Manufacturing Process

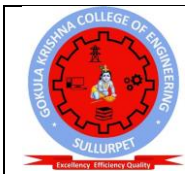
Course Objectives:

- To introduce the students to working principle of different metal casting processes and gating system.
- To impart knowledge on plastic deformation, cold and hot working process, working of a rolling mill and types, extrusion processes.
- To teach principles of forging, tools and dies, working of forging processes.
- To develop fundamental understanding on classification of the welding processes, working of different types of welding processes and welding defects.
- To impart knowledge on manufacturing methods of plastics, ceramics and powder metallurgy.
- To introduce the basic concepts of Unconventional Machining Processes.

Course Outcomes (CO):

At the end of the course, the student will be able to

- Demonstrate different metal casting processes and gating systems. (L2)
- Classify working of various welding processes. (L2)
- Evaluate the forces and power requirements in rolling process. (L5)
- Apply the principles of various forging operations. (L3)
- Outline the manufacturing methods of plastics, ceramics and powder metallurgy. (L1)
- Identify different unconventional processes and their applications. (L3)



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Course Name: Thermodynamics

Course Objectives:

- To introduce the concepts of heat, work, energy and governing rules for conversion of one form to other.
- To explain relationships between properties of matter and basic laws of thermodynamics.
- To teach the concept of entropy for identifying the disorder and feasibility of a thermodynamic process.
- To introduce the concept of available energy for maximum work conversion.
- To impart knowledge on steam properties.
- To provide fundamental concepts of air standard cycles used in IC engines and gas turbines.

Course Outcomes (CO):

After completing the course, the student will be able to:

- Understand the importance of thermodynamic properties related to conversion of heat energy into work. (L1)
- Apply the laws of thermodynamics to boilers, heat pumps, refrigerators, heat engines, compressors and nozzles. (L3)
- Utilize steam properties to design steam based components. (L4)
- Analyze thermodynamic relations and air standard cycles. (L5)

Course Name: Mechanics of Materials

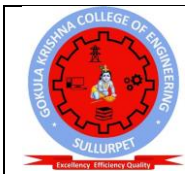
Course Objectives:

- Understand the basics of stresses and strains
- Draw the shear force and bending moment drawings of various beams.
- Understand the Behaviour of members and Torsional forces
- Understand the Behaviour of cylinders
- Understand the stresses developing in curved beams.

Course Outcomes (CO):

- Evaluate stresses and strains
- To draw the SF and BM diagrams for various beams under different loading conditions
- Determine the resistance and deformation in machine members subjected to torsional loads and springs.
- Analyze and design thin, thick cylinders.
- Analysis of stresses in curved bars.

Course Name: Fluid mechanics & Hydraulic Machines LAB



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Course Objectives:

By performing this laboratory, the student will be able to know the fluid flow measurements by considering different types flow measurement devices and working principles of various pumps and motors.

Course Outcomes (CO):

By performing the various tests in this laboratory the student will be able to know the principles of discharge measuring devices and head loss due to sudden contraction and expansion in pipes and working principles of various pumps and motors.

Course Name: Manufacturing processes LAB

Course Objectives:

- Acquire practical knowledge on Metal Casting, Welding, Press Working and unconventional machining Processes

Course Outcomes (CO):

At the end of the lab, the student will be able to

- Fabricate different types of components using various manufacturing techniques. (L6)
- Adapt unconventional manufacturing methods. (L6)

Course Name: Mechanics of materials LAB

Course Objectives:

- By performing this laboratory, the student will be able to know the structural behavior of various materials

Course Outcomes (CO):

- By performing the various tests in this laboratory the student will be able to know the structural behavior of various structural elements when subjected to external loads

Course Name: Applied Thermodynamics

Course Objectives:

- To introduce students to the Working Principles of IC engines.
- To teach combustion process in SI and CI engines.
- To impart knowledge on different types of compressors.
- To familiarize concepts of thermodynamic cycles used in steam power plants and gas turbines



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- To impart knowledge on the working of nozzles, turbines, refrigeration and air conditioning.

Course Outcomes (CO):

- After completing this course, the students can
- Understand the working of IC engines with combustion process. (L1)
- Select compressors for different applications. (L2)
- Use T-s diagram in vapour power and gas power cycles. (L3)
- Evaluate the relative performance of different steam turbines (L6)
- Select appropriate refrigerant for different applications. (L6)

Course Name: Kinematics Of Machinery

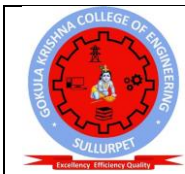
Course Objectives:

The Objectives of this course are to:

- To provide a foundation for the study of Dynamics of Machinery and machine design.
- Comprehend the fundamentals of kinematics and to understand the concept of machines, mechanisms and related terminologies.
- Analyze a mechanism for displacement, velocity and acceleration at any point in a moving link.
- To develop skills for designing and analyzing linkages and mechanisms.
- Formulate the concept of synthesis and analysis of different mechanisms.
- To understand the Principles and working of various straight line motion mechanisms.
- To analyze Steering gear mechanisms and working of Hooke's joint.
- To understand the theory of gears, gear trains and cams.

Course Outcomes (CO):

- Build up critical thinking and problem-solving capacity of various mechanical engineering problems related to kinematics of machines (L4)
- Understand the basic principles of mechanisms in mechanical engineering (L1)
- Assess various concepts of mechanisms like straight line motion mechanisms, Steering gear mechanisms and working principles of power elements (Gears, gear trains, Cams) and design related problems effectively (L6)
- Examine the velocity and acceleration diagram for a given mechanism (L3)
- Utilize analytical, mathematical and graphical aspects of kinematics of Machines for effective design (L3)
- Construct the cam profile for a given motion (L3)



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- Analyze various gear trains (L4)

Course Name: Manufacturing Technology

Course Objectives:

- To introduce the parameters in the metal cutting operation.
- To relate tool wear and tool life and the variables that control them.
- To calculate machining times for different machining processes.
- To impart knowledge on various metal cutting processes. (Lathe, drilling, boring shaping, slotting, milling and grinding).
- To teach the principles of jigs and fixtures and types of clamping and work holding devices.

Course Outcomes (CO):

At the end of the course, the student will be able to

- Choose cutting processes and variables. (L3)
- Relate tool wear and tool life. (L1)
- Calculate the machining parameters for different machining processes. (L5)
- Identify methods to generate different types of surfaces. (L3)
- Explain work-holding requirements. (L2)
- Design jigs and fixtures. (L6)

Course Name: Applied Thermodynamics LAB

Course Objectives:

- Understand the functioning and performance of I.C. Engines
- To find heat losses in various engines

Course Outcomes (CO):

Upon the successful completion of course, students will be able to

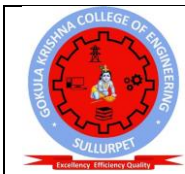
- Explain different working cycles of engine
- Describe various types of combustion chambers in IC engines
- Illustrate the working of refrigeration and air conditioning systems
- Evaluate heat balance sheet of IC engine

Course Name: Manufacturing Technology LAB

Course Objectives:

- Familiarize the construction and working of various machine tools.
- Teach selection of parameters for different machining processes.

Course Outcomes (CO):



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After completion of this course the student may be able to

- Implement the concept of machining with various machine tools.(L5)
- Get hands on experience on various machine tools and machining operations. (L5)

Course Name: Computer Aided Machine Drawing

Course Objectives:

- Introduce conventional representations of material and machine components.
- Train to use software for 2D and 3D modeling.
- Familiarize with thread profiles, riveted, welded and key joints.
- Teach solid modeling of machine parts and their sections.
- Explain creation of 2D and 3D assembly drawings.
- Familiarize with limits, fits and tolerances in mating components

Course Outcomes (CO):

After completion of this lab student will be able to

- Demonstrate the conventional representations of materials and machine components.
- Model riveted, welded and key joints using CAD system.
- Create solid models and sectional views of machine components.
- Generate solid models of machine parts and assemble them.
- Translate 3D assemblies into 2D drawings.
- Create manufacturing drawing with dimensional and geometric tolerances.

Course Name: CAD/CAM

Course Objectives:

- Understand the basics of CAD/CAM, geometric representation, transformations.
- Explain geometric modeling methods in CAD.
- Familiarize numerical control (NC), computer numerical control (CNC) and direct numerical control (DNC) machines.
- Impart knowledge on manual part programming and computer aided part programming.
- Explain the principles robotics, CIM, AR,VR and AI in CIM

Course Outcomes(CO):

- Apply the basics of geometric representation and transformations in CAD/CAM. L3
- Choose geometric modelling methods for building CAD models. L1
- Compare NC, CNC and DNC. L2
- Develop manual and computer aided part programming for turning and milling operations. L3



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- Summarize the principles of robotics AR, VR and AI in CIM.

Course Name: Design Of Machine Members

Course Objectives:

- Provide an introduction to design of machine elements.
- Familiarize with fundamental approaches to failure prevention for static and dynamic loading.
- Explain design procedures to different types of joints.
- Teach principles of clutches and brakes and design procedures.
- Instruct different types of bearings and design procedures.

Course Outcomes:

At the end of the course the students will be able to

- Estimate safety factors of machine members subjected to static and dynamic loads. (L5)
- Design fasteners subjected to variety of loads. (L6)
- Select of standard machine elements such as keys, shafts, couplings, springs and bearings. (L1)
- Design clutches brakes and spur gears. (L6)

Course Name: Metrology& Measurements

Course Objectives:

- Introduce the basic concepts of metrology and measurement methods.
- Demonstrate the importance of metrology in manufacturing
- Explain the concepts of transducers and its practical applications.
- Expose with various measuring instruments
- Familiarize calibration methods of various measuring instruments.

Course Outcomes:

- List various measuring instruments used in metrology.
- Examine geometry of screw threads and gear profiles.
- Measure force, torque and pressure.
- Calibrate various measuring instruments.

Course Name: Metrology& Measurements Lab

Course Objectives:

- To experiment with measuring equipments used for linear and angular measurements.



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- To find common types of errors in measurement equipment.
- To experiment with different types of sensors, transducers and strain gauges equipment.
- To make use of thermocouples for measurement of temperature.

Course Outcomes:

- At the end of course the students will be able to:
- Apply different instruments to measure length, width, depth, bore diameters, internal and external tapers, tool angles, and surface roughness.
- Measure effective diameter of thread profile.
- Conduct different machine alignment tests.
- Measure temperature, displacement, and pressure.

Course Name: Computer Aided MODELING

Course Objectives:

- To train the students with CAD packages.
- To impart the 2D and 3D modeling skills to the students.
- To import and export different IGES files from one software to another

Course Outcomes:

- Students will be able to design different parts of mechanical equipment's
- Students will be able to apply their skills in various designing and Manufacturing Industries.

Course Name: Dynamics Of Machinery

Course Objectives:

- Analysis of forces acting in mechanisms
- Effects of unbalance forces
- Modelling and analyzing the vibration behaviour of spring mass damper system
- The principles in mechanisms used for governing of machines

Course Outcomes:

- At the end of the course, the student will be able to
- Determine the forces acting on various linkages when a mechanism is subjected to external forces.
- Identify and correct the unbalances of rotating body
- Analyze the vibratory motion of SDOF systems.
- Reduce the magnitude of vibration and isolate vibration of dynamic systems
- Determine dimensions of Governors for speed control.



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Course Name: Finite Element Methods

Course Objectives:

- Familiarize basic principles of finite element analysis procedure.
- Explain theory and characteristics of finite elements that represent engineering structures.
- Apply finite element solutions to structural, thermal, dynamic problem.
- Learn to model complex geometry problems and solution techniques.

Course Outcomes:

- Upon successful completion of this course you should be able to
- Understand the concepts behind variational methods and weighted residual methods in FEM.
- Identify the application and characteristics of FEA elements such as bars, beams, and isoparametric elements, and 3-D element.
- Develop element characteristic equation procedure and generation of global stiffness equation will be applied.
- Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.
- Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer and fluid flow.

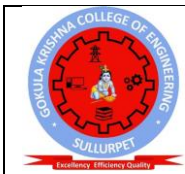
Course Name: Heat Transfer

Course Objectives:

- Familiarize basic principles of finite element analysis procedure.
- Explain theory and characteristics of finite elements that represent engineering structures.
- Apply finite element solutions to structural, thermal, dynamic problem.
- Learn to model complex geometry problems and solution techniques.
- Course Outcomes: Upon successful completion of this course you should be able to
- Understand the concepts behind variational methods and weighted residual methods in Fem.

Course Outcomes:

- Identify the application and characteristics of FEA elements such as bars, beams, and isoparametric elements, and 3-D element.
- Develop element characteristic equation procedure and generation of global stiffness equation will be applied.



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- Able to apply Suitable boundary conditions to a global structural equation, and reduce it to a solvable form.
- Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer and fluid flow.

Course Name: Computer Aided Design LAB

Course Objectives:

- To use the commercial Finite Element packages to build Finite Element models and solve a selected range of engineering problems.
- To validate a Finite Element model using a range of techniques.
- To communicate effectively in writing to report (both textually and graphically) the method used, the implementation and the numerical results obtained.
- To discuss the accuracy of the Finite Element solutions.

Course Outcomes

- Ability to solve engineering problems using the commercial software's such as ANSYS,
- SIMUFACT, ABAQUS, SIMULIA, Mathematical, MAT LAB, GNU Octave, Scilab, MAPLE/ COMSOL.

Course Name: Computer Aided Manufacturing LAB

Course Objectives:

- To get practical knowledge on manual part programming of CNC lathe machine by using G codes and M codes.
- To get practical knowledge on manual part programming of CNC milling and drilling machine by using G codes and M codes.
- To get the practical knowledge on APT language.
- To get practical application of Industrial Robots

Course Outcomes:

- Upon successful completion students should be able to:
- Use and understanding of Preparatory and Miscellaneous (G& M) codes to generate or edit a program which will operate a CNC Lathe/ Milling and Drilling.
- Apply mathematical methods to calculate World/ Joint/ Tool coordinates in robotics.
- Apply the programming concepts of Robots for simple applications in material handling and assembly

Course Name: Heat Transfer LAB



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Course Objectives:

Students undergoing this course would

- Understand different modes of heat transfer
- Gain knowledge about natural and forced convection phenomenon
- Estimate experimental uncertainty in measurements

Course Outcomes:

Upon the successful completion of course, students will be able to

- Explain different modes of heat transfer
- Identify parameters for measurement for calculating heat transfer
- Determine effectiveness of heat exchanger
- Design new equipment related to heat transfer
- Apply principles of heat transfer in wide application in industries.