

# SREE NARAYANA GURUKULAM COLLEGE OF ENGINEERING

[Affiliated to APJ Abdul Kalam Technological University, Kerala]  
Kadayiruppu P O, Ernakulam, Kerala – 682 311

<b>SREE NARAYANA GURUKULAM COLLEGE OF ENGINEERING, KADAYIRUPPU</b>		
<b>Department of Mechanical Engineering</b>		
<b>BTech in Mechanical Engineering 2019 - Scheme</b>		
<b>Semester I</b>		
<b>Course Code &amp; Course Name</b>	<b>CO No</b>	<b>CO Description</b>
<b>EST 110 ENGINEERING GRAPHICS</b>	CO1	Draw the projection of points and lines located in different quadrants
	CO2	Prepare multiview orthographic projections of objects by visualizing them in different positions
	CO3	Draw sectional views and develop surfaces of a given object
	CO4	Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions.
	CO5	Convert 3D views to orthographic views
	CO6	Obtain multiview projections and solid models of objects using CAD tools
<b>HUN 101 LIFE SKILLS</b>	CO1	Define and Identify different life skills required in personal and professional life
	CO2	Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.
	CO3	Explain the basic mechanics of effective communication and demonstrate these through presentations.
	CO4	Take part in group discussions
	CO5	Use appropriate thinking and problem solving techniques to solve new problems
	CO6	Understand the basics of teamwork and leadership

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<b>Semester II</b>		
<b>Course Code &amp; Course Name</b>	<b>CO No</b>	<b>CO Description</b>
<b>EST 120 BASICS OF CIVIL &amp; MECHANICAL ENGINEERING</b>	CO1	Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.
	CO2	Explain different types of buildings, building components, building materials and building construction
	CO3	Describe the importance, objectives and principles of surveying.
	CO4	Summarise the basic infrastructure services MEP, HVAC, elevators, escalators and ramps
	CO5	Discuss the Materials, energy systems, water management and environment for green buildings.
	CO6	Analyse thermodynamic cycles and calculate its efficiency
	CO7	Illustrate the working and features of IC Engines
	CO8	Explain the basic principles of Refrigeration and Air Conditioning
	CO9	Describe the working of hydraulic machines
	CO10	Explain the working of power transmission elements
	CO11	Describe the basic manufacturing, metal joining and machining processes
<b>HUN102 PROFESSIONAL COMMUNICATION</b>	CO1	Develop vocabulary and language skills relevant to engineering as a profession
	CO2	Analyze, interpret and effectively summarize a variety of textual content
	CO3	Create effective technical presentations
	CO4	Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus
	CO5	Identify drawbacks in listening patterns and apply listening techniques for specific needs

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	CO6	Create professional and technical documents that are clear and adhering to all the necessary conventions
ESL 120 CIVIL & MECHANICAL WORKSHOP	CO1	Name different devices and tools used for civil engineering measurements
	CO2	Explain the use of various tools and devices for various field measurements
	CO3	Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work.
	CO4	Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing.
	CO5	Compare different techniques and devices used in civil engineering measurements
	CO6	Identify Basic Mechanical workshop operations in accordance with the material and objects
	CO7	Apply appropriate Tools and Instruments with respect to the mechanical workshop trades
	CO8	Apply appropriate safety measures with respect to the mechanical workshop trades

Semester III		
Course Code & Course Name	CO No	CO Description
MET201 MECHANICS OF SOLIDS	CO1	Determine the stresses, strains and displacements of structures by tensorial and graphical (Mohr's circle) approaches
	CO2	Analyse the strength of materials using stress-strain relationships for structural and thermal loading.
	CO3	Perform basic design of shafts subjected to torsional loading and analyse beams subjected to bending moments
	CO4	Determine the deformation of structures subjected to various loading conditions using strain energy methods.
	CO5	Analyse column buckling and appreciate the theories of failures and its relevance in engineering design.

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MET203 MECHANICS OF FLUIDS	CO1	Define Properties of Fluids and Solve hydrostatic problems.
	CO2	Explain fluid kinematics and Classify fluid flows.
	CO3	Interpret Euler and Navier-Stokes equations and Solve problems using Bernoulli's equation.
	CO4	Evaluate energy losses in pipes and sketch energy gradient lines.
	CO5	Explain the concept of boundary layer and its applications.
	CO6	Use dimensional Analysis for model studies.
MET 205 METALLURGY & MATERIAL SCIENCE	CO1	Understand the basic chemical bonds, crystal structures (BCC, FCC, and HCP), and their relationship with the properties.
	CO2	Analyze the microstructure of metallic materials using phase diagrams and modify the microstructure and properties using different heat treatments.
	CO3	How to quantify mechanical integrity and failure in materials.
	CO4	Apply the basic principles of ferrous and non-ferrous metallurgy for selecting materials for specific applications.
	CO5	Define and differentiate engineering materials on the basis of structure and properties for engineering applications.
MEL201 COMPUTER AIDED MACHINE DRAWING	CO1	Apply the knowledge of engineering drawings and standards to prepare standard dimensioned drawings of machine parts and other engineering components.
	CO2	Prepare standard assembly drawings of machine components and valves using part drawings and bill of materials.
	CO3	Apply limits and tolerances to components and choose appropriate fits for given assemblies.
	CO4	Interpret the symbols of welded, machining and surface roughness on the component drawings.
	CO5	Prepare part and assembly drawings and Bill of Materials of machine components and valves using CAD software.
MEL203	CO1	To understand the basic concepts of analysis of circular shafts subjected to torsion.

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COURSE NAME MATERIALS TESTING LAB	CO2	To understand the behaviour of engineering component subjected to cyclic loading and failure concepts.
	CO3	Evaluate the strength of ductile and brittle materials subjected to compressive, Tensile shear and bending forces.
	CO4	Evaluate the microstructural morphology of ductile or brittle materials and its fracture modes (ductile /brittle fracture) during tension test.
	CO5	To specify suitable material for applications in the field of design and manufacturing.
EST 200 DESIGN & ENGINEERING	CO1	Explain the different concepts and principles involved in design engineering
	CO2	Apply design thinking while learning and practicing engineering.
	CO3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.
MCN201 SUSTAINABLE ENGINEERING	CO1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
	CO2	Explain the different types of environmental pollution problems and their sustainable solutions
	CO3	Discuss the environmental regulations and standards
	CO4	Outline the concepts related to conventional and non-conventional energy
	CO5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

### Semester IV

Course Code & Course Name	CO No	CO Description
MET202 ENGINEERING THERMODYNAMICS	CO1	Understand basic concepts and laws of thermodynamics
	CO2	Conduct first law analysis of open and closed systems
	CO3	Determine entropy and availability changes associated with different processes
	CO4	Understand the application and limitations of different equations of

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	CO5	Determine change in properties of pure substances during phase change processes
	CO6	Evaluate properties of ideal gas mixtures
MET 204 MANUFACTURING PROCESS	CO1	Illustrate the basic principles of foundry practices and special casting processes, their advantages, limitations and applications.
	CO2	Categorize welding processes according to welding principle and material.
	CO3	Understand requirements to achieve sound welded joint while welding different similar and dissimilar engineering materials.
	CO4	Student will estimate the working loads for pressing, forging, wire drawing etc.
	CO5	Recommend appropriate part manufacturing processes when provided a set of functional requirements and product development constraints.
MET206 FLUID MACHINERY	CO1	Explain the characteristics of centrifugal and reciprocating pumps
	CO2	Calculate forces and work done by a jet on fixed or moving plate and curved plates
	CO3	Explain the working of turbines and Select a turbine for specific application.
	CO4	Analyse the working of air compressors and Select the suitable one based on application.
	CO5	Analyse gas turbines and Identify the improvements in basic gas turbine cycles.
	CO6	Explain the characteristics of centrifugal and reciprocating pumps
MEL202 FM & HM LAB	CO1	Determine the coefficient of discharge of flow measuring devices (notches, orifice meter and Venturi meter)
	CO2	Calibrate flow measuring devices (notches, orifice meter and Venturi meter)
	CO3	Evaluate the losses in pipes

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	CO4	Determine the metacentric height and stability of floating bodies
	CO5	Determine the efficiency and plot the characteristic curves of different types of pumps and turbines
MACHINE TOOLS LAB- I	CO1	The students can operate different machine tools with understanding of work holders and operating principles to produce different part features to the desired quality.
	CO2	Apply cutting mechanics to metal machining based on cutting force and power consumption.
	CO3	Select appropriate machining processes and process parameters for different metals.
	CO4	Fabricate and assemble various metal components by welding and students will be able to visually examine their work and that of others for discontinuities and defects.
	CO6	Show national and patriotic spirit as responsible citizens of the country
HUT200 PROFESSIONAL ETHICS	CO1	Understand the core values that shape the ethical behaviour of a professional.
	CO2	Adopt a good character and follow an ethical life.
	CO3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
	CO4	Solve moral and ethical problems through exploration and assessment by established experiments.
	CO5	Apply the knowledge of human values and social values to contemporary ethical values and global issues

Semester V		
Course Code & Course Name	CO No	CO Description
MET301 MECHANICS OF MACHINERY	CO1	Explain the fundamentals of kinematics, various planar mechanisms and interpret the basic principles of mechanisms and machines
	CO2	Perform analysis and synthesis of mechanisms

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	CO3	Solve the problem on cams and gear drives, including selection depending on requirement.
	CO4	Calculate the gyroscopic effect in various situations
	CO5	Analyse rotating and reciprocating masses for its unbalance
MET303 THERMAL ENGINEERING	CO1	Explain the working of steam power cycle and related components
	CO2	Discuss the working of steam turbines and methods for evaluating the performance
	CO3	Illustrate the performance testing and evaluation of IC engines
	CO4	Explain the combustion phenomenon and pollution in IC engines
	CO5	Discuss the principles of refrigeration and air-conditioning and basic design considerations
MET206 INDUSTRIAL & SYSTEMS ENGINEERING	CO1	Implement various tools and techniques in industrial engineering
	CO2	Calculate the inventory system for a given requirement
	CO3	Explain the importance of industrial relations
	CO4	Select the lean manufacturing tools to find and eliminate wastes
	CO5	Identify the framework of agile manufacturing
	CO6	Identify core and extended modules of enterprise resource planning
MET 307 MACHINE TOOLS AND METROLOGY	CO1	Analyze various machining process and calculate relevant quantities such as velocities, forces and powers.
	CO2	Analyze of the tool nomenclature with surface roughness obtainable in each machining processes.
	CO3	Understand the limitations of various machining process with regard to shape formation and surface texture.
	CO4	Demonstrate knowledge of the underlying principles of measurement.
	CO5	Get an exposure to advanced measuring devices and machine tool metrology.
MEL331	CO1	Apply the procedures to measure length, angles, width, depth, bore diameters, internal and external tapers, tool angles, and surface roughness by



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MACHINE TOOLS LAB II		using different instruments and by different indirect methods.
	CO2	Determine limits and fits and allocate tolerances for machine components.
	CO3	CNC programming and to use coordinate measuring machine to record measurements of complex profiles with high sensitivity.
	CO4	Use effective methods of measuring straightness, Squareness, flatness, roundness, profile, screw threads and gear teeth.
	CO5	Securing knowledge of manufacturing components within the tolerance limit and surface roughness according to given drawings using various machine tools.
MEL334 THERMAL ENGINEERING LAB-II	CO1	Evaluate thermal properties of materials in conduction, convection and radiation
	CO2	Analyse the performance of heat exchangers
	CO3	Illustrate the operational performances of refrigeration and air conditioning systems
	CO4	Perform calibration of thermocouples and pressure gauges
HUT 310 MANAGEMENT FOR ENGINEERS	CO1	Explain the characteristics of management in the contemporary context (Cognitive Knowledge level: Understand).
	CO2	Describe the functions of management (Cognitive Knowledge level: Understand).
	CO3	Demonstrate ability in decision making process and productivity analysis (Cognitive Knowledge level: Understand).
	CO4	Illustrate project management technique and develop a project schedule (Cognitive Knowledge level: Apply).
	CO5	Summarize the functional areas of management (Cognitive Knowledge level: Understand).
	CO6	Comprehend the concept of entrepreneurship and create business plans (Cognitive Knowledge level: Understand).
MCN 301 DISASTER MANAGEMENT	CO1	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: Understand).
	CO2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment (Cognitive knowledge level: Understand).

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	CO3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk (Cognitive knowledge level: Understand).
	CO4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community (Cognitive knowledge level: Apply)
	CO5	Identify factors that determine the nature of disaster response and discuss the various disaster response actions (Cognitive knowledge level: Understand).
	CO6	Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level: Understand).

### Semester VI

Course Code & Course Name	CO No	CO Description
MET302 HEAT & MASS TRANSFER	CO1	Apply principles of heat and mass transfer to engineering problems
	CO2	Analyse and obtain solutions to problems involving various modes of heat transfer
	CO3	Design heat transfer systems such as heat exchangers, fins, radiation shields etc.
	CO4	Define laminar and turbulent boundary layers and ability to formulate energy equation in flow systems.
MET304 DYNAMICS AND DESIGN OF MACHINERY	CO1	Do engine force analysis and to draw turning moment diagrams
	CO2	Analyse free and forced vibrations of single degree of freedom systems
	CO3	Determine the natural frequencies of a two degree of freedom vibrating system and to calculate the stresses in a structural member due to combined loading.
	CO4	Design machine elements subjected to fatigue loading and riveted joints
	CO5	Design welded joint and close coiled helical compression spring
MET 306 ADVANCED	CO1	To be conversant with the advanced machining process and to appreciate the effect of process parameters on the surface integrity aspects during the advanced machining process

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MANUFACTURING ENGINEERING	CO2	CNC programming, select appropriate tooling and fixtures.
	CO3	To categorize the various nontraditional material removal process based on energy sources and mechanism employed.
	CO4	Analyze the processes and evaluate the role of each process parameter during micro machining of various advanced material removal processes.
	CO5	Explain the processes used in additive manufacturing for a range of materials and applications.
MEL332 COMPUTER AIDED DESIGN & ANALYSIS LAB	CO1	Gain working knowledge in Computer Aided Design and modelling procedures
	CO2	Gain knowledge in creating solid machinery parts.
	CO3	Gain knowledge in assembling machine elements.
	CO4	Gain working knowledge in Finite Element Analysis.
	CO5	Solve simple structural, heat and fluid flow problems using standard software
MEL334 THERMAL ENGINEERING LAB-II	CO1	Evaluate thermal properties of materials in conduction, convection and radiation
	CO2	Analyse the performance of heat exchangers
	CO3	Illustrate the operational performances of refrigeration and air conditioning systems
	CO4	Perform calibration of thermocouples and pressure gauges
MET 312  NON DESTRUCTIVE TESTING	CO1	Have a basic knowledge of surface NDT which enables to carry out various inspections in accordance with the established procedures.
	CO2	The students will be able to differentiate various defect types and select the appropriate NDT methods for the specimen.
	CO3	Calibrate the instrument and evaluate the component for imperfections.
	CO4	Have a basic knowledge of ultrasonic testing which enables them to perform inspection of samples.

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	CO5	Have a complete theoretical and practical understanding of the radiographic testing, interpretation and evaluation.
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Semester VII		
Course Code & Course Name	CO No	CO Description
MET401 DESIGN OF MACHINE ELEMENTS	CO1	Design shafts based on strength, rigidity and design for static and fatigue loads, design flat belts and connecting rod of IC engines
	CO2	Design clutches and brakes
	CO3	Analyse sliding contact bearings and understand design procedure of journal, ball and roller bearings.
	CO4	Design Spur gear and helical gear
	CO5	Design Bevel gears and worm gears
MET463 OPERATIONS MANAGEMENT	CO1	Understand operations, production system and perform facility location analysis.
	CO2	Impart knowledge of facility layout, layout planning and perform line balancing.
	CO3	Compute demand forecast and forecast accuracy.
	CO4	Perform aggregate planning and materials requirement planning.
	CO5	Apply various algorithms for production scheduling.
MET445 RENEWABLE ENERGY ENGINEERING	CO1	Explain renewable energy sources and evaluate the implication of renewable energy
	CO2	Explain solar energy collectors, storages, solar cell characteristics and applications
	CO3	Explain the different types of wind power machines and control strategies of wind turbines
	CO4	Explain the ocean energy and conversion devices and different Geothermal sources
	CO5	Explain biomass energy conversion devices. Calculate the Net Present value and payback period
	CO1	Get practical knowledge on design and analysis of mechanisms in the machines.

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MEL411 MECHANICAL ENGINEERING LAB	CO2	Measure the cutting forces associated with milling machining operations.
	CO3	Apply the basic concepts of hydraulic and pneumatic actuators and their applications in product and processes
	CO4	Use appropriate systems for data acquisition and control of product and processes mapping of course outcomes with program outcomes
MEQ413 SEMINAR	CO1	Identify academic documents from the literature which are related to her/his areas of interest
	CO2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest
	CO3	Prepare a presentation about an academic document
	CO4	Give a presentation about an academic document
	CO5	Prepare a technical report
MED415 PROJECT PHASE I	CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
	CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
	CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
	CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
	CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
	CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

<b>Semester VIII</b>		
Course Code & Course Name	CO No	CO Description
MET402	CO1	Explain the sensors and actuators used in mechatronics
	CO2	Design hydraulic and pneumatic circuits for automation.

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MECHATRONICS	CO3	Explain the manufacturing processes used in MEMS
	CO4	Demonstrate the various components of a CNC machine
	CO5	Create a PLC program
	CO6	Explain the robotic sensors and vision system
MET414 QUALITY MANAGEMENT	CO1	To be conversant with important terms for quality management in organisations
	CO2	Have a complete theoretical and practical understanding of the contributions of Quality Gurus
	CO3	Demonstrate knowledge of the underlying principles of strategic quality management
	CO4	Identify various human dimensions of TQM
	CO5	Implement different tools and techniques in TQM
	CO6	Identify core and extended modules of ISO 9000 family of standards
MET458 ADVANCED ENERGY ENGINEERING	CO1	Explain the concept of various types of power generation
	CO2	Explain solar and wind power generation and its economics
	CO3	Explain biomass energy sources and its economics
	CO4	Explain various renewable energy sources
	CO5	Explain environmental impacts of various energy generation
MET476 CRYOGENIC ENGINEERING	CO1	Explain the properties of cryogenic liquids and properties of material at cryogenic temperatures
	CO2	Describe and analyze cryogenic liquefaction systems using first principles of thermodynamics
	CO3	Describe and analyze cryogenics refrigeration using first principles of thermodynamics
	CO4	Identify insulation system for cryogenic application and explain cryogenic storage vessels.
	CO5	Understand gas separation and purification methods

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	CO6	Understand instrumentation for various measurements in cryogenic
MED416 PROJECT PHASE II	CO1	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
	CO2	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
	CO3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
	CO4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
	CO5	Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
	CO6	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

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