ARJUN COLLEGE OF TECHNOLOGY
Thamaraikulam, Coimbatore – Pollachi Highway, Coimbatore- 642120
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An ISO 9001:2015 Certified Institution

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MECHANICAL ENGINEERING

2017 Regulation

Course Outcomes

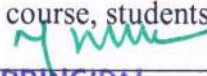| S.No	Course Code & Title	Course Outcome
1	HS8151 COMMUNICATIVE ENGLISH	At the end of the course, learners will be able to: **CO1** Read articles of a general kind in magazines and newspapers. **CO2** Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English. **CO3** Comprehend conversations and short talks delivered in English **CO4** Write short essays of a general kind and personal letters and emails in English.
2	MA8151 ENGINEERING MATHEMATICS – I	After completing this course, students should demonstrate competency in the following skills: **CO1** Use both the limit definition and rules of differentiation to differentiate functions. **CO2** Apply differentiation to solve maxima and minima problems. **CO3** Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus. **CO4** Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables. **CO5** Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts. **CO6** Determine convergence/divergence of improper integrals and evaluate convergent improper integrals. **CO7** Apply various techniques in solving differential equations.
3	PH8151 ENGINEERING PHYSICS	Upon completion of this course, **CO1** the students will gain knowledge on the basics of properties of matter and its applications, **CO2** the students will acquire knowledge on the concepts of waves and optical devices and

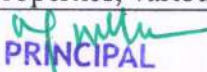|		their
		applications in fibre optics, **CO3** the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers, **CO4** the students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes,and **CO5** the students will understand the basics of crystals, their structures and different crystal growth techniques
4	CY8151 ENGINEERING CHEMISTRY	**CO1** The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.
5	GE8151 PROBLEM SOLVING AND PYTHON PROGRAMMING	Upon completion of the course, students will be able to **CO1** Develop algorithmic solutions to simple computational problems **CO2** Read, write, execute by hand simple Python programs. **CO3** Structure simple Python programs for solving problems. **CO4** Decompose a Python program into functions. **CO5** Represent compound data using Python lists, tuples, dictionaries. **CO6** Read and write data from/to files in Python Programs.
6	GE8152 ENGINEERING GRAPHICS	On successful completion of this course, the student will be able to **CO1** familiarize with the fundamentals and standards of Engineering graphics **CO2** perform freehand sketching of basic geometrical constructions and multiple views of objects. **CO3** project orthographic projections of lines and plane surfaces. **CO4** draw projections and solids and development of surfaces. **CO5** visualize and to project isometric and perspective sections of simple solids.
7	GE8161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	Upon completion of the course, students will be able to

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		CO1 Write, test, and debug simple Python programs. **CO2** Implement Python programs with conditionals and loops. **CO3** Develop Python programs step-wise by defining functions and calling them. **CO4** Use Python lists, tuples, dictionaries for representing compound data. **CO5** Read and write data from/to files in Python.
8	BS8161 PHYSICS AND CHEMISTRY LABORATORY	**PHYSICS LABORATORY** Upon completion of the course, the students will be able to **CO1** apply principles of elasticity, optics and thermal properties for engineering applications. **CHEMISTRY LABORATORY** **CO1** The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.
9	HS8251 TECHNICAL ENGLISH	At the end of the course learners will be able to: **CO1** Read technical texts and write area-specific texts effortlessly. **CO2** Listen and comprehend lectures and talks in their area of specialisation successfully. **CO3** Speak appropriately and effectively in varied formal and informal contexts. **CO4** Write reports and winning job applications.
10	MA8251 ENGINEERING MATHEMATICS – II	After successfully completing the course, the student will have a good understanding of the following topics and their applications: **CO1** Eigen values and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices. **CO2** Gradient, divergence and curl of a vector point function and related identities. **CO3** Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification. **CO4** Analytic functions, conformal mapping and complex integration. **CO5** Laplace transform and inverse transform of simple functions, properties, various related

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		theorems and application to differential equations with constant coefficients.
11	PH8251 MATERIALS SCIENCE	Upon completion of this course, **CO1** the students will have knowledge on the various phase diagrams and their applications **CO2** the students will acquire knowledge on Fe-Fe3C phase diagram, various microstructures and alloys **CO3** the students will get knowledge on mechanical properties of materials and their measurement **CO4** the students will gain knowledge on magnetic, dielectric and superconducting properties of materials **CO5** the students will understand the basics of ceramics, composites and nanomaterials.
12	BE8253 BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING	Ability to **CO1** Understand electric circuits and working principles of electrical machines **CO2** Understand the concepts of various electronic devices **CO3** Choose appropriate instruments for electrical measurement for a specific application
13	GE8291 ENVIRONMENTAL SCIENCE AND ENGINEERING	**CO1** Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course. **CO2** Public awareness of environmental is at infant stage. **CO3** Ignorance and incomplete knowledge has lead to misconceptions **CO4** Development and improvement in std. of living has lead to serious environmental disasters
14	GE8292 ENGINEERING MECHANICS	On successful completion of this course, the student will be able to **CO1** illustrate the vectorial and scalar representation of forces and moments **CO2** analyse the rigid body in equilibrium **CO3** evaluate the properties of surfaces and solids **CO4** calculate dynamic forces exerted in rigid body

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		CO5 determine the friction and the effects by the laws of friction
15	GE8261 ENGINEERING PRACTICES LABORATORY	On successful completion of this course, the student will be able to **CO1** fabricate carpentry components and pipe connections including plumbing works. **CO2** use welding equipments to join the structures. **CO3** Carry out the basic machining operations **CO4** Make the models using sheet metal works **CO5** Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and fittings **CO6** Carry out basic home electrical works and appliances **CO7** Measure the electrical quantities **CO8** Elaborate on the components, gates, soldering practices.
16	BE8261 BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING LABORATORY	**CO1** Ability to determine the speed characteristic of different electrical machines **CO2** Ability to design simple circuits involving diodes and transistors **CO3** Ability to use operational amplifiers
17	MA8353 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	Upon successful completion of the course, students should be able to: **CO1** Understand how to solve the given standard partial differential equations. **CO2** Solve differential equations using Fourier series analysis which plays a vital role in engineering applications. **CO3** Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations. **CO4** Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering. **CO5** Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.
18	ME8391 ENGINEERING THERMODYNAMICS	Upon the completion of this course the students will be able to **CO1** Apply the first law of thermodynamics

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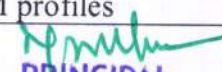Coimbatore - 642 120

		for simple open and closed systems under steady and unsteady conditions. **CO2** Apply second law of thermodynamics to open and closed systems and calculate entropy and availability. **CO3** Apply Rankine cycle to steam power plant and compare few cycle improvement methods **CO4** Derive simple thermodynamic relations of ideal and real gases **CO5** Calculate the properties of gas mixtures and moist air and its use in psychometric processes
19	CE8394 FLUID MECHANICS AND MACHINERY	Upon completion of this course, the students will be able to **CO1** Apply mathematical knowledge to predict the properties and characteristics of a fluid. **CO2** Can analyse and calculate major and minor losses associated with pipe flow in piping networks. **CO3** Can mathematically predict the nature of physical quantities **CO4** Can critically analyse the performance of pumps **CO5** Can critically analyse the performance of turbines.
20	ME8351 MANUFACTURING TECHNOLOGY – I	**CO1** Explain different metal casting processes, associated defects, merits and demerits **CO2** Compare different metal joining processes. **CO3** Summarize various hot working and cold working methods of metals. **CO4** Explain various sheet metal making processes. **CO5** Distinguish various methods of manufacturing plastic components.
21	EE8353 ELECTRICAL DRIVES AND CONTROLS	**CO1** Upon Completion of this subject, the students can able to explain different types of electrical machines and their performance
22	ME8361 MANUFACTURING TECHNOLOGY LABORATORY – I	Upon the completion of this course the students will be able to **CO1** Demonstrate the safety precautions exercised in the mechanical workshop. **CO2** Make the work piece as per given shape and size using Lathe.

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		CO3 Join two metals using arc welding. **CO4** Use sheet metal fabrication tools and make simple tray and funnel. **CO5** Use different moulding tools, patterns and prepare sand moulds.
23	ME8381 COMPUTER AIDED MACHINE DRAWING	Upon the completion of this course the students will be able to **CO1** Follow the drawing standards, Fits and Tolerances **CO2** Re-create part drawings, sectional views and assembly drawings as per standards
24	EE8361 ELECTRICAL ENGINEERING LABORATORY	**CO1** Ability to perform speed characteristic of different electrical machine
25	HS8381 INTERPERSONAL SKILLS/LISTENING & SPEAKING	At the end of the course Learners will be able to: **CO1** Listen and respond appropriately. **CO2** Participate in group discussions **CO3** Make effective presentations **CO4** Participate confidently and appropriately in conversations both formal and informal
26	MA8452 STATISTICS AND NUMERICAL METHODS	Upon successful completion of the course, students will be able to: **CO1** Apply the concept of testing of hypothesis for small and large samples in real life problems. **CO2** Apply the basic concepts of classifications of design of experiments in the field of agriculture. **CO3** Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems. **CO4** Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations. **CO5** Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications
27	ME8492 KINEMATICS OF MACHINERY	Upon the completion of this course the students will be able to **CO1** Discuss the basics of mechanism **CO2** Calculate velocity and acceleration in simple mechanisms **CO3** Develop CAM profiles

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		CO4 Solve problems on gears and gear trains
		CO5 Examine friction in machine elements
28	ME8451 MANUFACTURING TECHNOLOGY – II	Upon the completion of this course the students will be able to CO1 Explain the mechanism of material removal processes. CO2 Describe the constructional and operational features of centre lathe and other special purpose lathes. CO3 Describe the constructional and operational features of shaper, planner, milling, drilling, sawing and broaching machines. CO4 Explain the types of grinding and other super finishing processes apart from gear manufacturing processes. CO5 Summarize numerical control of machine tools and write a part program.
29	ME8491 ENGINEERING METALLURGY	Upon the completion of this course the students will be able to CO1 Explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification. CO2 Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes. CO3 Clarify the effect of alloying elements on ferrous and non-ferrous metals CO4 Summarize the properties and applications of non-metallic materials. CO5 Explain the testing of mechanical properties.
30	CE8395 STRENGTH OF MATERIALS FOR MECHANICAL ENGINEERS	Students will be able to CO1 Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes. CO2 Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment. CO3 Apply basic equation of simple torsion in designing of shafts and helical spring CO4 Calculate the slope and deflection in beams using different methods. CO5 Analyze and design thin and thick shells for the applied internal and external pressures.

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31	ME8493 THERMAL ENGINEERING - I	Upon the completion of this course the students will be able to **CO1** Apply thermodynamic concepts to different air standard cycles and solve problems. **CO2** Solve problems in single stage and multistage air compressors **CO3** Explain the functioning and features of IC engines, components and auxiliaries. **CO4** Calculate performance parameters of IC Engines. **CO5** Explain the flow in Gas turbines and solve problems.
32	ME8462 MANUFACTURING TECHNOLOGY LABORATORY – II	Upon the completion of this course the students will be able to **CO1** use different machine tools to manufacturing gears **CO2** Ability to use different machine tools to manufacturing gears. **CO3** Ability to use different machine tools for finishing operations **CO4** Ability to manufacture tools using cutter grinder **CO5** Develop CNC part programming
33	CE8381 STRENGTH OF MATERIALS AND FLUID MECHANICS AND MACHINERY LABORATORY	**CO1** Ability to perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.
34	HS8461 ADVANCED READING AND WRITING	At the end of the course Learners will be able to: **CO1** Write different types of essays. **CO2** Write winning job applications. **CO3** Read and evaluate texts critically. **CO4** Display critical thinking in various professional contexts.
35	ME8595 THERMAL ENGINEERING – II	Upon the completion of this course the students will be able to **CO1** Solve problems in Steam Nozzle **CO2** Explain the functioning and features of different types of Boilers and auxiliaries and calculate performance parameters. **CO3** Explain the flow in steam turbines, draw velocity diagrams for steam turbines and solve problems. **CO4** Summarize the concept of Cogeneration, Working features of Heat pumps and Heat exchangers

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		CO5 Solve problems using refrigerant table / charts and psychrometric charts
36	ME8593 DESIGN OF MACHINE ELEMENTS	Upon the completion of this course the students will be able to **CO1** Explain the influence of steady and variable stresses in machine component design. **CO2** Apply the concepts of design to shafts, keys and couplings. **CO3** Apply the concepts of design to temporary and permanent joints. **CO4** Apply the concepts of design to energy absorbing members, connecting rod and crank shaft. **CO5** Apply the concepts of design to bearings.
37	ME8501 METROLOGY AND MEASUREMENTS	Upon the completion of this course the students will be able to **CO1** Describe the concepts of measurements to apply in various metrological instruments **CO2** Outline the principles of linear and angular measurement tools used for industrial applications **CO3** Explain the procedure for conducting computer aided inspection **CO4** Demonstrate the techniques of form measurement used for industrial components **CO5** Discuss various measuring techniques of mechanical properties in industrial applications
38	ME8594 DYNAMICS OF MACHINES	Upon the completion of this course the students will be able to **CO1** Calculate static and dynamic forces of mechanisms. **CO2** Calculate the balancing masses and their locations of reciprocating and rotating masses. **CO3** Compute the frequency of free vibration. **CO4** Compute the frequency of forced vibration and damping coefficient. **CO5** Calculate the speed and lift of the governor and estimate the gyroscopic effect on automobiles, ships and airplanes.
39	ME8511 KINEMATICS AND DYNAMICS LABORATORY	Upon the completion of this course the students will be able to **CO1** Explain gear parameters, kinematics of mechanisms, gyroscopic effect and working of lab equipments. **CO2** Determine mass moment of inertia of

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		mechanical element, governor effort and range sensitivity, natural frequency and damping coefficient, torsional frequency, critical speeds of shafts, balancing mass of rotating and reciprocating masses, and transmissibility ratio.
40	ME8512 THERMAL ENGINEERING LABORATORY	Upon the completion of this course the students will be able to **CO1** conduct tests on heat conduction apparatus and evaluate thermal conductivity of materials. **CO2** conduct tests on natural and forced convective heat transfer apparatus and evaluate heat transfer coefficient. **CO3** conduct tests on radiative heat transfer apparatus and evaluate Stefan Boltzmann constant and emissivity. **CO4** conduct tests to evaluate the performance of parallel/counter flow heat exchanger apparatus and reciprocating air compressor. **CO5** conduct tests to evaluate the performance of refrigeration and air-conditioning test rigs.
41	ME8513 METROLOGY AND MEASUREMENTS LABORATORY	Upon the completion of this course the students will be able to **CO1** Measure the gear tooth dimensions, angle using sine bar, straightness and flatness, thread parameters, temperature using thermocouple, force, displacement, torque and vibration. **CO2** Calibrate the vernier, micrometer and slip gauges and setting up the comparator for the inspection.
42	ME8651 DESIGN OF TRANSMISSION SYSTEMS	Upon the completion of this course the students will be able to **CO1** apply the concepts of design to belts, chains and rope drives. **CO2** apply the concepts of design to spur, helical gears. **CO3** apply the concepts of design to worm and bevel gears. **CO4** apply the concepts of design to gear boxes . **CO5** apply the concepts of design to cams, brakes and clutches
43	ME8691 COMPUTER AIDED DESIGN AND MANUFACTURING	Upon the completion of this course the students will be able to **CO1** Explain the 2D and 3D transformations,

		clipping algorithm, Manufacturing models and Metrics **CO2** Explain the fundamentals of parametric curves, surfaces and Solids **CO3** Summarize the different types of Standard systems used in CAD **CO4** Apply NC & CNC programming concepts to develop part programme for Lathe & Milling Machines **CO5** Summarize the different types of techniques used in Cellular Manufacturing and FMS
44	ME8693 HEAT AND MASS TRANSFER	Upon the completion of this course the students will be able to **CO1** Apply heat conduction equations to different surface configurations under steady state and transient conditions and solve problems **CO2** Apply free and forced convective heat transfer correlations to internal and external flows through/over various surface configurations and solve problems **CO3** Explain the phenomena of boiling and condensation, apply LMTD and NTU methods of thermal analysis to different types of heat exchanger configurations and solve problems **CO4** Explain basic laws for Radiation and apply these principles to radiative heat transfer between different types of surfaces to solve problems **CO5** Apply diffusive and convective mass transfer equations and correlations to solve problems for different applications
45	ME8692 FINITE ELEMENT ANALYSIS	**CO1** Summarize the basics of finite element formulation. **CO2** Apply finite element formulations to solve one dimensional Problems. **CO3** Apply finite element formulations to solve two dimensional scalar Problems. **CO4** Apply finite element method to solve two dimensional Vector problems. **CO5** Apply finite element method to solve problems on iso parametric element and dynamic Problems.
46	ME8694 HYDRAULICS AND PNEUMATICS	Upon the completion of this course the students will be able to **CO1** Explain the Fluid power and operation of

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		different types of pumps. **CO2** Summarize the features and functions of Hydraulic motors, actuators and Flow control valves **CO3** Explain the different types of Hydraulic circuits and systems **CO4** Explain the working of different pneumatic circuits and systems **CO5** Summarize the various trouble shooting methods and applications of hydraulic and pneumatic systems.
47	ME8681 CAD / CAM LABORATORY	**CO1** Draw 3D and Assembly drawing using CAD software **CO2** Demonstrate manual part programming with G and M codes using CAM
48	ME8682 DESIGN AND FABRICATION PROJECT	Upon the completion of this course the students will be able to **CO1** design and Fabricate the machine element or the mechanical product. **CO2** demonstrate the working model of the machine element or the mechanical product.
49	HS8581 PROFESSIONAL COMMUNICATION	At the end of the course Learners will be able to: **CO1** Make effective presentations **CO2** Participate confidently in Group Discussions. **CO3** Attend job interviews and be successful in them **CO4** Develop adequate Soft Skills required for the workplace
50	ME8792 POWER PLANT ENGINEERING	Upon the completion of this course the students will be able to **CO1** Explain the layout, construction and working of the components inside a thermal power plant. **CO2** Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants. **CO3** Explain the layout, construction and working of the components inside nuclear power plants. **CO4** Explain the layout, construction and working of the components inside Renewable energy power plants. **CO5** Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and

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		estimate the costs of electrical energy production.
51	ME8793 PROCESS PLANNING AND COST ESTIMATION	Upon the completion of this course the students will be able to **CO1** select the process, equipment and tools for various industrial products. **CO2** prepare process planning activity chart. **CO3** explain the concept of cost estimation. **CO4** compute the job order cost for different type of shop floor. **CO5** calculate the machining time for various machining operations.
52	ME8791 MECHATRONICS	Upon the completion of this course the students will be able to **CO1** Discuss the interdisciplinary applications of Electronics, Electrical, Mechanical and Computer Systems for the Control of Mechanical, Electronic Systems and sensor technology. **CO2** Discuss the architecture of Microprocessor and Microcontroller, Pin Diagram, Addressing Modes of Microprocessor and Microcontroller. **CO3** Discuss Programmable Peripheral Interface, Architecture of 8255 PPI, and various device interfacing **CO4** Explain the architecture, programming and application of programmable logic controllers to problems and challenges in the areas of Mechatronic engineering. **CO5** Discuss various Actuators and Mechatronics system using the knowledge and skills acquired through the course and also from the given case studies
53	ME8711 SIMULATION AND ANALYSIS LABORATORY	Upon the completion of this course the students will be able to **CO1** simulate the working principle of air conditioning system, hydraulic and pneumatic cylinder and cam follower mechanisms using MATLAB. **CO2** analyze the stresses and strains induced in plates, brackets and beams and heat transfer problems. **CO3** calculate the natural frequency and mode shape analysis of 2D components and beams.

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54	ME8781 MECHATRONICS LABORATORY	Upon the completion of this course the students will be able to **CO1** Demonstrate the functioning of mechatronics system with various pneumatic, hydraulic and electrical systems. **CO2** Demonstrate the functioning of control systems with the help of PLC and microcontrollers.
56	MG8591 PRINCIPLES OF MANAGEMENT	**CO1** Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management
57	ME8811 PROJECT WORK	**CO1** On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.
58	ME8091 AUTOMOBILE ENGINEERING	Upon the completion of this course the students will be able to **CO1** recognize the various parts of the automobile and their functions and materials. **CO2** discuss the engine auxiliary systems and engine emission control. **CO3** distinguish the working of different types of transmission systems. **CO4** explain the Steering, Brakes and Suspension Systems. **CO5** predict possible alternate sources of energy for IC Engines.
59	PR8592 WELDING TECHNOLOGY	Upon completion of this course, the students can able **CO1** Understand the construction and working principles of gas and arc welding process. **CO2** Understand the construction and working principles of resistance welding process. **CO3** Understand the construction and working principles of various solid state welding process. **CO4** Understand the construction and working principles of various special welding processes. **CO5** Understand the concepts on weld joint design, weldability and testing of weldments.
60	ME8096 GAS DYNAMICS AND JET PROPULSION	Upon the completion of this course the students will be able to **CO1** Apply the concept of compressible flows in variable area ducts.

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		CO2 Apply the concept of compressible flows in constant area ducts. **CO3** Examine the effect of compression and expansion waves in compressible flow. **CO4** Use the concept of gas dynamics in Jet Propulsion. **CO5** Apply the concept of gas dynamics in Space Propulsion.
61	GE8075 INTELLECTUAL PROPERTY RIGHTS	**CO1** Ability to manage Intellectual Property portfolio to enhance the value of the firm
62	GE8073 FUNDAMENTALS OF NANOSCIENCE	**CO1** Will familiarize about the science of nanomaterials **CO2** Will demonstrate the preparation of nanomaterials **CO3** Will develop knowledge in characteristic nanomaterial
63	ME8071 REFRIGERATION AND AIR CONDITIONING	Upon the completion of this course the students will be able to **CO1** Explain the basic concepts of Refrigeration **CO2** Explain the Vapor Compression Refrigeration systems and to solve problems **CO3** Discuss the various types of Refrigeration systems **CO4** Calculate the Psychrometric properties and its use in psychrometric processes **CO5** Explain the concepts of Air conditioning and to solve problems
64	ME8072 RENEWABLE SOURCES OF ENERGY	Upon the completion of this course the students will be able to **CO1** Discuss the importance and Economics of renewable Energy **CO2** Discuss the method of power generation from Solar Energy **CO3** Discuss the method of power generation from Wind Energy **CO4** Explain the method of power generation from Bio Energy **CO5** Explain the Tidal energy, Wave Energy, OTEC, Hydro energy, Geothermal Energy, Fuel Cells and Hybrid Systems.
65	ME8098 QUALITY CONTROL AND RELIABILITY ENGINEERING	Upon the completion of this course the students will be able to **CO1** Summarize the concept of Quality and Process control for variables **CO2** Apply the process control for attributes

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		CO3 Explain the concept of sampling and to solve problems CO4 Explain the concept of Life testing CO5 Explain the concept Reliability and techniques involved
66	ME8073 UNCONVENTIONAL MACHINING PROCESSES	Upon the completion of this course the students will be able to CO1 Explain the need for unconventional machining processes and its classification CO2 Compare various thermal energy and electrical energy based unconventional machining processes. CO3 Summarize various chemical and electro-chemical energy based unconventional machining processes. CO4 Explain various nano abrasives based unconventional machining processes. CO5 Distinguish various recent trends based unconventional machining processes.
67	MG8491 OPERATIONS RESEARCH	CO1 Upon completion of this course, the students can able to use the optimization techniques for use engineering and Business problems
68	MF8071 ADDITIVE MANUFACTURING	CO1 On completion of this course, students will learn about the working principle and construction of Additive Manufacturing technologies, their potential to support design and manufacturing, modern development in additive manufacturing process and case studies relevant to mass customized manufacturing.
69	GE8077 TOTAL QUALITY MANAGEMENT	CO1 The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.
70	ME8099 ROBOTICS	Upon the completion of this course the students will be able to CO1 Explain the concepts of industrial robots, classification, specifications and coordinate systems. Also summarize the need and application of robots in different sectors. CO2 Illustrate the different types of robot drive systems as well as robot end effectors. CO3 Apply the different sensors and image processing techniques in robotics to improve the ability of robots. CO4 Develop robotic programs for different tasks and familiarize with the kinematics

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		motions of robot. **CO5** Examine the implementation of robots in various industrial sectors and interpolate the economic analysis of robots.
71	ME8095 DESIGN OF JIGS, FIXTURES AND PRESS TOOLS	Upon the completion of this course the students will be able to **CO1** Summarize the different methods of Locating Jigs and Fixtures and Clamping principles **CO2** Design and develop jigs and fixtures for given component **CO3** Discuss the press working terminologies and elements of cutting dies **CO4** Distinguish between Bending and Drawing dies. **CO5** Discuss the different types of forming techniques
72	ME8093 COMPUTATIONAL FLUID DYNAMICS	Upon the completion of this course the students will be able to **CO1** Derive the governing equations and boundary conditions for Fluid dynamics **CO2** Analyze Finite difference and Finite volume methods for Diffusion **CO3** Analyze Finite volume method for Convective diffusion **CO4** Analyze Flow field problems **CO5** Explain and solve the Turbulence models and Mesh generation techniques
73	ME8097 NON DESTRUCTIVE TESTING AND EVALUATION	Upon the completion of this course the students will be able to **CO1** Explain the fundamental concepts of NDT **CO2** Discuss the different methods of NDE **CO3** Explain the concept of Thermography and Eddy current testing **CO4** Explain the concept of Ultrasonic Testing and Acoustic Emission **CO5** Explain the concept of Radiography
74	ME8092 COMPOSITE MATERIALS AND MECHANICS	Upon the completion of this course the students will be able to **CO1** Summarize the various types of Fibers, Equations and manufacturing methods for Composite materials **CO2** Derive Flat plate Laminate equations **CO3** Analyze Lamina strength **CO4** Analyze the thermal behavior of

		Composite laminates **CO5** Analyze Laminate flat plates
75	GE8072 FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	Upon completion of the course, the students will be able to: **CO1** Define, formulate and analyze a problem **CO2** Solve specific problems independently or as part of a team **CO3** Gain knowledge of the Innovation & Product Development process in the Business Context **CO4** Work independently as well as in teams **CO5** Manage a project from start to finish
76	GE8074 HUMAN RIGHTS	**CO1** Engineering students will acquire the basic knowledge of human rights.
77	GE8071 DISASTER MANAGEMENT	The students will be able to **CO1** Differentiate the types of disasters, causes and their impact on environment and society **CO2** Assess vulnerability and various methods of risk reduction measures as well as mitigation. **CO3** Draw the hazard and vulnerability profile of India, Scenarious in the Indian context, Disaster damage assessment and management.
78	IE8693 PRODUCTION PLANNING AND CONTROL	**CO1** Upon completion of this course, the students can able to prepare production planning and control activities such as work study, product planning, production scheduling, Inventory Control. **CO2** They can plan manufacturing requirements manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP).
79	MG8091 ENTREPRENEURSHIP DEVELOPMENT	**CO1** Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.
80	ME8094 COMPUTER INTEGRATED MANUFACTURING SYSTEMS	**CO1** Explain the basic concepts of CAD, CAM and computer integrated manufacturing systems **CO2** Summarize the production planning and control and computerized process planning **CO3** Differentiate the different coding systems used in group technology **CO4** Explain the concepts of flexible manufacturing system (FMS) and automated guided vehicle (AGV) system

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		CO5 Classification of robots used in industrial applications
81	ME8074 VIBRATION AND NOISE CONTROL	Upon the completion of this course the students will be able to **CO1** Summarize the Basics of Vibration **CO2** Summarize the Basics of Noise **CO3** Explain the Sources of Automotive Noise **CO4** Discuss the Control techniques for vibration **CO5** Describe the sources and control of Noise
82	EE8091 MICRO ELECTRO MECHANICAL SYSTEMS	**CO1** Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems. **CO2** Ability to understand and analyse, linear and digital electronic circuits.
83	GE8076 PROFESSIONAL ETHICS IN ENGINEERING	**CO1** Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

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