SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

I. Effectuating success in careers by exploring with the design, digital and computational analysis of engineering systems, experimentation and testing, smart manufacturing, technical services, and research.

II. Amalgamating effectively with stakeholders to update and improve their core competencies and abilities to ethically compete in the ever-changing multicultural global enterprise.

III. To encourage multi-disciplinary research and development to foster advanced technology, and to nurture innovation and entrepreneurship in order to compete successfully in the global economy.

IV. To globally share and apply technical knowledge to create new opportunities that proactively advances our society through team efforts and to solve various challenging   technical, environmental and societal problems.

V. To create world class mechanical engineers capable of practice engineering ethically with a solid vision to become great leaders in academia, industries and society.

PROGRAM OUTCOMES (POs)

PO	GRADUATE ATTRIBUTE
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.
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.

HOD
Department of Mechanical Engineering
Ponnaiyah Ramalayam Institute of
Science & Technology (PRIST)
(Institution Deemed to be University
's 3 of the UGC Act 1956)
NJAVUR - 613 403, TAMIL NADU.

DEAN
School of Engineering and Tech.
Ponnaiyah Ramalayam Institute of
Science and Technology (PRIST)
Deemed to be University
Vallam, Thanjavur - 613 4. 3.

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 (PSOs)

On successful completion of the Mechanical Engineering Degree programme, the Graduates shall exhibit the following:
1. Apply the knowledge gained in Mechanical Engineering for design and development and manufacture of engineering systems.
2. Apply the knowledge acquired to investigate research-oriented problems in mechanical engineering with due consideration for environmental and social impacts.
3. Use the engineering analysis and data management tools for effective management of multidisciplinary projects.

PEO / PO MAPPING:

PEOs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
I.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
II.	3	2	2	2	2	1	1	1	3		2	1	2	3	3
III.	3	1	2	1	2	2	1		1	2		3	3	2	2
IV.	2	2	2	2	2		2				1	2	2	3	3
V.	3	2	2	2	1	3	2	2	2	1	1	3	3	2	2

PRIST
DEEMED TO BE
UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMIL NADU

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

B.TECH - FULL TIME (UG - 2017)

COURSE CODE	COURSE TITLE	CO	COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
17147S11	COMMUNICATIVE ENGLISH	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.							✓		
17148S12	ENGINEERING MATHEMATICS – I	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.			✓						

Course Code	Course Name	CO	Description	1	2	3	4	5	6	7	8	9	10	11	12
		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.					✓							
17149S13	ENGINEERING PHYSICS	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											✓	

Code	Subject	CO	Description											
		CO5	the students will understand the basics of crystals, their structures and different crystal growth techniques.				✓							
17149S14	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.				✓							
17154S15	ENGINEERING GRAPHICS	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.				✓							
17150S16	PROBLEM SOLVING AND PYTHON PROGRAMMING	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.					✓						

Code	Course	CO	Outcome												
		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.						✓						
17150L17	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY	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.	✓											
17150L18	PHYSICS AND CHEMISTRY LABORATORY	CO1	apply principles of elasticity, optics and thermal properties for engineering applications.				✓								
17147S21	TECHNICAL ENGLISH	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.									✓			

Course Code	Course Name	CO	Course Outcome												
		CO4	Write reports and winning job applications.									✓			
17148S22	ENGINEERING MATHEMATICS – II	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 theorems and application to differential equations with constant coefficients.												✓
17149S23C	MATERIALS SCIENCE	CO1	the students will have knowledge on the various phase diagrams and their applications				✓								
		CO2	the students will acquire knowledge on Fe-Fe$_3$C phase diagram,various microstructures and alloys				✓								

Code	Course Name	CO	Description												
		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.										✓	
17149S24A	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			✓								
17153S25D	BASIC ELECTRICAL ELECTRONICS AND INSTRUMENTATION ENGINEERING	CO1	Understand electric circuits and working principles of electrical machines			✓								
		CO2	Understand the concepts of various electronic devices			✓								

Code	Subject	CO	Outcome	1	2	3	4	5	6	7	8	9	10	11	12
		CO3	Choose appropriate instruments for electrical measurement for a specific application											✓	
17154S26D	ENGINEERING MECHANICS	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											✓	
		CO5	determine the friction and the effects by the laws of friction												✓
17154L27	ENGINEERING PRACTICES LABORATORY	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			✓									

Code	Subject	CO	Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13
		CO8	Elaborate on the components, gates, soldering practices.			✓										
17153L28D	**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			✓										
17148S31C	**TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**	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.												✓	

Code	Subject	CO	Course Outcome							
		CO5	Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.						✓	
17154C32	ENGINEERING THERMODYNAMICS	CO1	Apply the first law of thermodynamics 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							✓
17154C33	FLUID MECHANICS AND MACHINERY	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				✓			

Code	Subject	CO	Course Outcome									
		CO5	Can critically analyse the performance of turbines.					✓				
17154C34	PRODUCTION 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.								✓	
17154C35	ELECTRICAL DRIVES AND CONTROLS	CO1	Upon Completion of this subject, the students can able to explain different types of electrical machines and their performance	✓								
17154L36	PRODUCTION TECHNOLOGY LABORATORY – I	CO1	Demonstrate the safety precautions exercised in the mechanical workshop.			✓						
		CO2	Make the workpiece as per given shape and size using Lathe.				✓					
		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.								✓	
17154L37	COMPUTER AIDED MACHINE	CO1	Follow the drawing standards, Fits and Tolerances			✓						

Subject Code	Subject	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
	DRAWING	**CO2**	Re-create part drawings, sectional views and assembly drawings as per standards				✓								
17154L38	**ELECTRICAL ENGINEERING LABORATORY**	**CO1**	Ability to perform speed characteristic of different electrical machine			✓									
17154L39	**INTERPERSONAL SKILLS/LISTENING & SPEAKING**	**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			✓									
17148C41 D	**STATISTICS AND NUMERICAL METHODS**	**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.				✓								

Code	Course	CO	Outcome	1	2	3	4	5	6	7	8	9	10
		CO5	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications					✓					
17154C42	THEORY OF MACHINES-I	CO1	Discuss the basics of mechanism	✓									
		CO2	Calculate velocity and acceleration in simple mechanisms		✓								
		CO3	Develop CAM profiles			✓							
		CO4	Solve problems on gears and gear trains					✓					
		CO5	Examine friction in machine elements					✓					
17154C43	PRODUCTION TECHNOLOGY – II	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.								✓		
17154C44	ENGINEERING METALLURGY	CO1	Explain alloys and phase diagram, Iron-Iron carbon diagram and steel								✓		

Code	Course	CO	Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
			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. .										✓		
17154C45	STRENGTH OF MATERIALS FOR MECHANICAL ENGINEERS	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.					✓							
17154C46	THERMAL ENGINEERING - I	CO1	Apply thermodynamic concepts to different air standard cycles and	✓											

Code	Course	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12
			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.						✓						
17154L47	PRODUCTION TECHNOLOGY LABORATORY – II	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				✓								
17154L48	STRENGTH OF MATERIALS AND FLUID MECHANICS AND MACHINERY LABORATORY	CO1	Ability to perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.						✓						
		CO2	Perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.						✓						

Code	Subject	CO	Description											
		CO3	Use the measurement equipments for flow measurement.					✓						
		CO4	Perform test on different fluid machinery.					✓						
17154L 49	ADVANCED READING AND WRITING	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.											✓
17154C51	THERMAL ENGINEERING – II	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									✓		
		CO5	Solve problems using refrigerant table / charts and psychrometric charts									✓		
17154C52	DESIGN OF MACHINE ELEMENTS	CO1	Explain the influence of steady and variable stresses in machine component design.		✓									

Course Code	Course Name	CO	Course Outcome												
		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.												✓
17154C53	METROLOGY AND MEASUREMENTS	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										✓		
17154C54	THEORY OF MACHINES-II	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			✓									

Code	Course	CO	Description												
			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.							✓					
17154L56	THEORY OF MACHINES LABORATORY	CO1	Explain gear parameters, kinematics of mechanisms, gyroscopic effect and working of lab equipments.	✓											
		CO2	Determine mass moment of inertia of 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.		✓										
17154L57	THERMAL ENGINEERING LABORATORY	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.			✓									

Code	Course	CO	Description												
		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 airconditioning test rigs.					✓							
17154L58	METROLOGY AND MEASUREMENTS LABORATORY	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.		✓										
17154C61	DESIGN OF TRANSMISSION SYSTEMS	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												✓
17154C62	COMPUTER AIDED DESIGN AND MANUFACTURING	CO1	Explain the 2D and 3D transformations, clipping algorithm, Manufacturing models and Metrics		✓										

Code	Course	CO	Outcome												
		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			✓									
17154C63	HEAT AND MASS TRANSFER	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				✓								

Code	Subject	CO	Description												
		CO5	Apply diffusive and convective mass transfer equations and correlations to solve problems for different applications											✓	
17154C64	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.												✓
17154C65	HYDRAULICS AND PNEUMATICS	CO1	Explain the Fluid power and operation of 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.											✓	

Code	Course	CO	Outcome								
17154E66A	AUTOMOBILE ENGINEERING	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.	✓							
17154L67	CAD / CAM LABORATORY	CO1	Draw 3D and Assembly drawing using CAD software	✓							
		CO2	Demonstrate manual part programming with G and M codes using CAM		✓						
17154L68	DESIGN AND FABRICATION PROJECT	CO1	design and Fabricate the machine element or the mechanical product.						✓		
		CO2	demonstrate the working model of the machine element or the mechanical product.							✓	
17154L69	PROFESSIONAL COMMUNICATION	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								✓

Code	Subject	CO	Outcome	1	2	3	4	5	6	7	8	9	10
17154C71	POWER PLANT ENGINEERING	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 estimate the costs of electrical energy production.								✓		
17154C72	PROCESS PLANNING AND COST ESTIMATION	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.								✓		

17154C73	MECHATRONICS	CO1	Discuss the interdisciplinary applications of Electronics, Electrical, Mechanical andComputer 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						✓					
17154E74D	UNCONVENTIONAL MACHINING PROCESSES	CO1	Explain the need for unconventional machining processes and its classification	✓										
		CO2	Compare various thermal energy and electrical energy based unconventional machining processes.		✓									

Subject Code	Subject Name	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12
		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.												✓
17154E76A	ROBOTICS	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 motions of robot.					✓							
		CO5	Examine the implementation of robots in various industrial sectors and interpolate the economic analysis of robots.											✓	
17155FE74B	WASTE WATER TREATMENT	CO1	Will have knowledge about adsorption and oxidation process.	✓											

Code	Subject	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12
		CO2	Will gain idea about various methods available for water treatment.		✓										
		CO3	Will appreciate the necessity of water and acquire knowledge of preliminary treatment.			✓									
17154L77	SIMULATION AND ANALYSIS LABORATORY	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.							✓					
17154L78	MECHATRONICS LABORATORY	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.		✓										
17154L79	TECHNICAL SEMINAR	CO1	To enrich the communication skills of the student and presentations of technical topics of interest, this course is introduced.	✓											

COURSE CODE	COURSE TITLE	CO	COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
17154C81	**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							✓		
17154E82A	**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).		✓							
17154PW8 3	**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.	✓								

DEPARTMENT OF MECHANICAL ENGINEERING

B.TECH - PART TIME (UG - 2017)

COURSE CODE	COURSE TITLE	CO	COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
17148H11P	**TRANSFORMS AND PARTIAL DIFFERENTIAL**	CO1	Understand how to solve the given standard partial differential equations.	✓								

Subject Code	Subject	CO	Course Outcome												
	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.										✓			
17153H12P	**ELECTRICAL DRIVES AND CONTROLS**	CO1	Upon Completion of this subject, the students can able to explain different types of electrical machines and their performance	✓												
17154H13P	**ENGINEERING THERMODYNAMICS**	CO1	Apply the first law of thermodynamics for simple open and closed systems under steady and unsteady conditions.	✓												

Code	Course	CO	Course Outcome												
		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										✓			
17154H14P	FLUID MECHANICS AND MACHINERY	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.					✓								
17154H15P	FOUNDRY AND WELDING TECHNOLOGY	CO1	Explain different metal casting processes, associated defects, merits and demerits			✓										
		CO2	Compare different metal joining processes.				✓									

Course Code	Course Name	CO	CO Statement												
		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.									✓			
17148H21P	NUMERICAL METHODS	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					✓							

					PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
17153H22P	ELECTRONICS AND MICROPROCESSORS	CO1	Upon Completion of this subject, the students can able to explain different types of electrical machines and their performance		✓											
17154H23P	THERMAL ENGINEERING	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.					✓								
17154H24P	STRENGTH OF MATERIALS	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.					✓								

Code	Course	CO	Outcome								
		CO5	Analyze and design thin and thick shells for the applied internal and external pressures.					✓			
17154H25P	ENGINEERING MATERIALS AND METALLURGY	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. .						✓		
17148H31 CP	PROBABILITY AND STATISTICS	CO1	The main objective of this course is to provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction and computer networks etc.	✓							
17154H32P	KINEMATICS OF MACHINERY	CO1	Discuss the basics of mechanism	✓							
		CO2	Calculate velocity and acceleration in simple mechanisms		✓						
		CO3	Develop CAM profiles			✓					

Course Code	Course Name	CO	Course Outcome												
		CO4	Solve problems on gears and gear trains						✓						
		CO5	Examine friction in machine elements						✓						
17154H33P	MACHINE TOOL TECHNOLOGY	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.										✓		
17154H34P	ENGINEERING METROLOGY AND MEASUREMENTS	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					✓							

Course Code	Course Name	CO	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
		CO4	Demonstrate the techniques of form measurement used for industrial components									✓	
		CO5	Discuss various measuring techniques of mechanical properties in industrial applications										✓
17154L35P	COMPUTER AIDED SIMULATION AND ANALYSIS LABORATORY	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.									✓	
17154H41P	POWER PLANT ENGINEERING	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.			✓							

Subject Code	Subject	CO	Course Outcome											
		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 estimate the costs of electrical energy production.									✓		
17154H42P	DYNAMICS OF MACHINERY	CO1	Discuss the basics of mechanism	✓										
		CO2	Calculate velocity and acceleration in simple mechanisms			✓								
		CO3	Develop CAM profiles				✓							
		CO4	Solve problems on gears and gear trains						✓					
		CO5	Examine friction in machine elements						✓					
17154H43P	DESIGN OF MACHINE ELEMENTS	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.											✓

17154E44DP	**RENEWABLE SOURCES OF ENERGY**	**CO1**	Understand the need of energy conversion and the various methods of energy storage	✓												
		CO2	Identify Winds energy as alternate form of energy and to know how it can be tapped		✓											
		CO3	Understand the Geothermal &Tidal energy, its mechanism of production and its applications		✓											
17154L45P	**DYNAMICS LABORATORY**	**CO1**	Explain gear parameters, kinematics of mechanisms, gyroscopic effect and working of lab equipments.	✓												
		CO2	Determine mass moment of inertia of 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.		✓											
17154H51P	**HEAT AND MASS TRANSFER**	**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		✓											

Subject Code	Subject Name	CO													
			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										✓		
17154H52P	DESIGN OF TRANSMISSION SYSTEMS	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											✓	

Code	Subject	CO	Statement	1	2	3	4	5	6	7	8	9	10	11	12
17154H53P	AUTOMOBILE ENGINEERING	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.	✓											
17154E54CP	ROBOTICS	CO1	Demonstrate knowledge of industrial robots, characteristics, end effectors and actuators.												
		CO2	Apply spatial transformation to obtain forward and inverse kinematics												
		CO3	Solve robot dynamics problems, generate joint trajectory for path planning												
		CO4	Describe working principle of various sensors and program different operations												
		CO5	Appreciate applications of robots in industry.												
17154L55P	HEAT TRANSFER LABORATORY	CO1	conduct tests on heat conduction apparatus and evaluate thermal conductivity of materials.	✓											

Course Code	Course Name	CO	Course Outcome									
		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 airconditioning test rigs.					✓				
17154H61P	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.									✓

Course Code	Course Name	CO	CO Statement	1	2	3	4	5	6	7	8	9	10	11	12
17154H62P	**MECHATRONICS**	CO1	Discuss the interdisciplinary applications of Electronics, Electrical, Mechanical andComputer 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					✓							
17154H63P	**COMPUTER INTEGRATED MANUFACTURING**	CO1	Explain the 2D and 3D transformations, clipping algorithm, Manufacturing models and Metrics		✓										

Code	Course	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12
		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			✓									
17160E64AP	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										✓		
17154L65P	MECHATRONICS LABORATORY	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.		✓										
17160H71P	TOTAL QUALITY MANAGEMENT	CO1	To get familiarized with the basic concept and framework of Total Quality management												

Code	Subject Name	CO	Description										
		CO2	To Understand the contribution of Quality Gurus in TQM Journey										
		CO3	To grasp the nature and importance of various components that constitute TQM										
		CO4	To describe and discuss the role of techniques used in TQM										
17154H72P	PROCESS PLANNING AND COST ESTIMATION	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.									✓	
17154H73P	APPLIED HYDRAULICS AND PNEUMATICS	CO1	Explain the Fluid power and operation of 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									✓	

Course Code	Course Name	CO	Statement	1	2	3	4	5	6	7	8	9	10	11	12
		CO5	Summarize the various trouble shooting methods and applications of hydraulic and pneumatic systems.											✓	
17154E74CP	UNCONVENTIONAL MACHINING PROCESSES	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.												✓
17154P75P	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.	✓											

DEPARTMENT OF MECHANICAL ENGINEERING

M.TECH - FULL TIME (PG - 2017)

COURSE CODE	COURSE TITLE	CO	COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
17248S11E	ADVANCED ENGINEERING MATHEMATICS	CO1	Understand Finite differences, interpolation techniques, Numerical differentiation and Integration and apply it to various practical problems	✓								
		CO2	Apply Numerical methods to solve first order ordinary differential equations and Algebraic and Transcendental equations		✓							
		CO3	Illustrate Laplace transform and its application in different fields			✓						
		CO4	Apply Fourier transforms and its applications to solve Ordinary and Partial differential equations				✓					
		CO5	Use Z-transform and its applications to solve difference equations					✓				
17254H12	THEORY OF METAL CUTTING	CO1	Apply cutting mechanics to metal machining based on cutting force and power consumption.	✓								
		CO2	Operate lathe, milling machines, drill press, grinding machines, etc.		✓							
		CO3	Select cutting tool materials and tool geometries for different	✓				✓				

Subject Code	Subject	CO	Course Outcome								
			metals.								
		CO4	Select appropriate machining processes and conditions for different metals.						✓		
		CO5	Learn machine tool structures and machining economics.						✓		
17254H13	ADVANCED MANUFACTURING PROCESSES	CO1	Able to understand different types of composite material characteristics, types of micro & macro machining processes.	✓							
		CO2	Understand the e-manufacturing & nano materials.		✓						
17254H14	MECHANICAL METALLURGY	CO1	Identify the properties of metals with respect to crystal structure and grain size			✓					
		CO2	Interpret the phase diagrams of materials						✓		
		CO3	Classify and Distinguish different types of cast irons, steels and non ferrous alloys	✓							
		CO4	Describe the concept of heat treatment of steels & strengthening mechanisms	✓							
		CO5	Explain the powder metallurgy process, types and manufacturing of composite materials								✓
17254H15	AUTOMATED COMPUTER INTEGRATED	CO1	to produce useful research output in computer integrated manufacturing					✓			

Course Code	Course Name	CO	Course Outcome										
	MANUFACTURING SYSTEMS	CO2	use this knowledge to develop computer techniques				✓						
		CO3	Application of this knowledge to functionalise computer aided planning.			✓							
17254E16A	MATERIALS MANAGEMENT AND LOGISTICS	CO1	Understanding basics of materials management							✓			
		CO2	Understanding requirement analysis for material planning	✓									
		CO3	Ability to apply inventory management models	✓									
		CO4	Understanding purchasing practices				✓						
		CO5	Understanding storage in warehouse				✓						
17254HRS	RESEARCH LED SEMINAR	CO1	Understand research problem formulation.				✓						
		CO2	Analyze research related information			✓							
		CO3	Follow research ethics			✓							
		CO4	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular								✓		

Course Code	Course Name	CO	Description												
		CO5	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity							✓					
17254L17	CIM LAB	CO1	To impart the knowledge on training the students in the area of CAD/CAM				✓								
17254H21	PRODUCTION MANAGEMENT	CO1	Understand the role of operations management in achieving organizational competitiveness		✓										
		CO2	Appreciate the concepts of lean production and maintenance management in operations	✓												
		CO3	Comprehend key decision areas of operations and analyze data for effective decision making in operations management.		✓											
17254H22	MEMS AND NANO TECHNOLOGY	CO1	Ability to understand the operation of micro devices, micro systems and their applications	✓												
		CO2	Ability to design the micro devices, micro systems using the MEMS fabrication process.	✓												
		CO3	Gain a knowledge of basic approaches for various sensor design		✓											
		CO4	Gain a knowledge of basic approaches for various actuator design			✓										

Course Code	Course Name	CO	Course Outcome										
17254H23	MANUFACTURING METROLOGY AND QUALITY CONTROL	CO1	They can choose appropriate method and instruments for inspection of various gear elements and thread elements. They can understand the standards of length, angles, they can understand the evaluation of surface finish and measure the parts with various comparators. The quality of the machine tool with alignment test can also be evaluated by them.				✓						
17254E24B	LEAN MANUFACTURING	CO1	The student will be able to practice the principles of lean manufacturing like customer focus, reduction of MUDA, just in time, Jidoka and Hoshin planning.	✓									
17254E25B	MAINTENANCE MANAGEMENT	CO1	Explain maintenance objectives and functions, factors influencing Plant Availability, Need for maintenance plan and organization, Functions of maintenance control and determine Failure probability, Survival probability and Age specific failure rates of equipments and components.		✓								

	CO												
	CO2	Determine the optimal overhaul/repair/replacement maintenance policy for an equipment subject to breakdown and optimal interval between preventive replacements for individual and group replacement of equipments.			✓								
	CO3	Explain different maintenance systems and the steps involved in establishing a maintenance plan and designing a technically sound preventive maintenance and lubrication program. (Comprehend)				✓							
	CO4	Determine the optimal inspection frequency for maximization of profit and minimization of down time and the critical path using CPM and PERT	✓										
	CO5	Explain the NUCREC method of prioritizing maintenance work, classification of spares and the costs associated with spares inventory, perform EOQ computations, explain MUSIC - 3D approach to spares management, determine the optimal number of spares to satisfy given service level and apply simulation technique for spares inventory.	✓										

Code	Subject	CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12
17254HRM	RESEARCH METHODOLOGY	CO1	After completion of the syllabus students will able to get knowledge about the different research techniques and research report.	✓											
17254HBR	PARTICIPATION IN BOUNDED RESEARCH	CO1	After completion of the syllabus students will able to get knowledge about the project report.		✓										
17254L26	AUTOMATION LAB	CO1	To perform documentation			✓									
		CO2	To perform accounting operations				✓								
		CO3	To perform presentation skills					✓							
172TECWR	TECHNICAL WRITING/SEMINAR	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		✓										
17254H31	METAL FORMING PROCESS	CO1	Determine major process/processes of manufacturing used for given application.			✓									
		CO2	Explain when and why metal forming is chosen compared to other compatible methods				✓								
		CO3	Analyze effect of parameters influencing metal forming and compare hot working and cold working with applications	✓											

Code	Course	CO	Outcome	1	2	3	4	5	6	7	8	9	10	11	12
		CO4	Explain capabilities and applications of bulk metal forming processes and sheet metal work.	✓											
		CO5	Outline tooling and equipments required for important metal forming processes.	✓											
17254E32B	INSTRUMENTATION AND CONTROL ENGINEERING	CO1	Ability to understand and analyse process control engineering problems.				✓								
17254E33B	FLUID POWER AUTOMATION	CO1	At the end of this course the students are familiarized in the area of hydraulics, pneumatic and fluid power components and its functions.					✓							
17254E34A	ADVANCED MATERIAL TECHNOLOGY	CO1	To impart knowledge on material selection methods and basics of advanced engineering materials.								✓				
		CO2	To introduce the basics of smart materials, composite materials, ceramics and glasses and modern										✓		
17254HSR	DESIGN PROJECT /SOCIO TECHNICAL PROJECT (SCAFFOLDED RESEARCH)	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.												✓
17254P35	PROJECT WORK PHASE I	CO1	On Completion of the project work students will be in a position to take up any challenging practical problems	✓											

COURSE CODE	COURSE TITLE	CO	COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
17254P41	PROJECT WORK PHASE II	CO1	On Completion of the project work students will be in a position to take up any challenging practical problems	✓								

DEPARTMENT OF MECHANICAL ENGINEERING

M.TECH - PART TIME (PG - 2017)

COURSE CODE	COURSE TITLE	CO	COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
17248S11EP	ADVANCED ENGINEERING MATHEMATICS	CO1	Understand Finite differences, interpolation techniques, Numerical differentiation and Integration and apply it to various practical problems	✓								
		CO2	Apply Numerical methods to solve first order ordinary differential equations and Algebraic and Transcendental equations		✓							
		CO3	Illustrate Laplace transform and its application in different fields			✓						
		CO4	Apply Fourier transforms and its applications to solve Ordinary and Partial differential equations				✓					
		CO5	Use Z-transform and its applications to solve difference equations					✓				
17254H12P	THEORY OF METAL CUTTING	CO1	Apply cutting mechanics to metal machining based on cutting force and power consumption.	✓								

Course Code	Course Name	CO	CO Statement	1	2	3	4	5	6	7	8	9	10	11	12
		CO2	Operate lathe, milling machines, drill press, grinding machines, etc.		✓										
		CO3	Select cutting tool materials and tool geometries for different metals.	✓					✓						
		CO4	Select appropriate machining processes and conditions for different metals.								✓				
		CO5	Learn machine tool structures and machining economics.								✓				
17254H13P	ADVANCED MANUFACTURING PROCESSES	CO1	Able to understand different types of composite material characteristics, types of micro & macro machining processes.	✓											
		CO2	Understand the e-manufacturing & nano materials.		✓										
17254L14P	CIM LAB	CO1	To impart the knowledge on training the students in the area of CAD/CAM				✓								
17254CRSP	RESEARCH LED SEMINAR	CO1	Understand research problem formulation.				✓								
		CO2	Analyze research related information		✓										
		CO3	Follow research ethics		✓										
		CO4	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in									✓			

Course Code	Course Name	CO	Outcome	1	2	3	4	5	6	7	8	9	10	11	12
			general & engineering in particular												
		CO5	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity							✓					
17254H21P	PRODUCTION MANAGEMENT	CO1	Understand the role of operations management in achieving organizational competitiveness		✓										
		CO2	Appreciate the concepts of lean production and maintenance management in operations	✓											
		CO3	Comprehend key decision areas of operations and analyze data for effective decision making in operations management.		✓										
17254H22P	MEMS AND NANO TECHNOLOGY	CO1	Ability to understand the operation of micro devices, micro systems and their applications	✓											
		CO2	Ability to design the micro devices, micro systems using the MEMS fabrication process.	✓											
		CO3	Gain a knowledge of basic approaches for various sensor design		✓										

Course Code	Course Name	CO	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
		CO4	Gain a knowledge of basic approaches for various actuator design			✓							
17254E23BP	LEAN MANUFACTURING	CO1	The student will be able to practice the principles of lean manufacturing like customer focus, reduction of MUDA, just in time, Jidoka and Hoshin planning.	✓									
17254L24P	AUTOMATION LAB	CO1	To perform documentation			✓							
		CO2	To perform accounting operations				✓						
		CO3	To perform presentation skills					✓					
172TECWRP	TECHNICAL WRITING/SEMINAR	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		✓								
17254CRMP	RESEARCH METHODOLOGY	CO1	After completion of the syllabus students will able to get knowledge about the different research techniques and research report.	✓									
17254CBRP	PARTICIPATION IN BOUNDED RESEARCH	CO1	After completion of the syllabus students will able to get knowledge about the project report.		✓								
17254H31P	MECHANICAL METALLURGY	CO1	Identify the properties of metals with respect to crystal structure and grain size			✓							

Course Code	Course Name	CO	CO Statement							
		CO2	Interpret the phase diagrams of materials						✓	
		CO3	Classify and Distinguish different types of cast irons, steels and non ferrous alloys	✓						
		CO4	Describe the concept of heat treatment of steels & strengthening mechanisms	✓						
		CO5	Explain the powder metallurgy process, types and manufacturing of composite materials							✓
17254H32P	AUTOMATED COMPUTER INTEGRATED MANUFACTURING SYSTEMS	CO1	to produce useful research output in computer integrated manufacturing					✓		
		CO2	use this knowledge to develop computer techniques				✓			
		CO3	Application of this knowledge to functionalise computer aided planning.			✓				
17254E33AP	MATERIALS MANAGEMENT AND LOGISTICS	CO1	Understanding basics of materials management						✓	
		CO2	Understanding requirement analysis for material planning	✓						
		CO3	Ability to apply inventory management models	✓						
		CO4	Understanding purchasing practices				✓			
		CO5	Understanding storage in warehouse				✓			

Code	Subject	CO	Statement										
17254CSRP	DESIGN PROJECT /SOCIO TECHNICAL PROJECT (SCAFFOLDED RESEARCH)	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.										✓
17254H41P	MANUFACTURING METROLOGY AND QUALITY CONTROL	CO1	They can choose appropriate method and instruments for inspection of various gear elements and thread elements. They can understand the standards of length, angles, they can understand the evaluation of surface finish and measure the parts with various comparators. The quality of the machine tool with alignment test can also be evaluated by them.				✓						
17254E43BP	MAINTENANCE MANAGEMENT	CO1	Explain maintenance objectives and functions, factors influencing Plant Availability, Need for maintenance plan and organization, Functions of maintenance control and determine Failure probability, Survival probability and Age specific failure rates of equipments and components.		✓								

		CO	Description												
		CO2	Determine the optimal overhaul/repair/replacement maintenance policy for an equipment subject to breakdown and optimal interval between preventive replacements for individual and group replacement of equipments.			✓									
		CO3	Explain different maintenance systems and the steps involved in establishing a maintenance plan and designing a technically sound preventive maintenance and lubrication program. (Comprehend)				✓								
		CO4	Determine the optimal inspection frequency for maximization of profit and minimization of down time and the critical path using CPM and PERT	✓											
		CO5	Explain the NUCREC method of prioritizing maintenance work, classification of spares and the costs associated with spares inventory, perform EOQ computations, explain MUSIC - 3D approach to spares management, determine the optimal number of spares to satisfy given service level and apply simulation technique for spares inventory.	✓											

17254H42P	**METAL FORMING PROCESS**	**CO1**	Determine major process/processes of manufacturing used for given application.			✓								
		CO2	Explain when and why metal forming is chosen compared to other compatible methods				✓							
		CO3	Analyze effect of parameters influencing metal forming and compare hot working and cold working with applications	✓										
		CO4	Explain capabilities and applications of bulk metal forming processes and sheet metal work.	✓										
		CO5	Outline tooling and equipments required for important metal forming processes.	✓										
17254P35	**PROJECT WORK PHASE I**	**CO1**	On Completion of the project work students will be in a position to take up any challenging practical problems	✓										
17254E51BP	**INSTRUMENTATION AND CONTROL ENGINEERING**	**CO1**	Ability to understand and analyse process control engineering problems.				✓							
17254E52BP	**FLUID POWER AUTOMATION**	**CO1**	At the end of this course the students are familiarized in the area of hydraulics, pneumatic and fluid power components and its functions.						✓					
17254E53AP	**ADVANCED MATERIAL TECHNOLOGY**	**CO1**	To impart knowledge on material selection methods and basics of advanced engineering materials.							✓				

		CO2	To introduce the basics of smart materials, composite materials, ceramics and glasses and modern										✓	
17254P41	**PROJECT WORK PHASE II**	CO1	On Completion of the project work students will be in a position to take up any challenging practical problems	✓										

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