Name of the Programme :BTech MECH (2019-23)																					
Semester	**Catalog Course Code**	**Title**	**Course Outcome No**	**CO List**	**PO 1 Engineering knowledge**	**PO 2 Problem analysis**	**PO 3 Design/ development of solutions**	**PO 4 Conduct investigations of complex**	**PO 5 Modern tool usage**	**PO 6 The engineer and society**	**PO 7 Environment and sustainability**	**PO 8 Ethics**	**PO 9 Individual and team work**	**PO 10 Communication**	**PO 11 Project management and finance**	**PO 12 Life-long learning**	**PO 13 Use of specialized software**	**PO 14 Create socially relevant systems**	**PSO 1 Engg and Practical knowledge**	**PSO 2 Cutting edge areas**
1	70125104	Engineering Graphics Lab	CO1	Understand and draw projections of points (0D) located in four quadrants	3															
			CO2	Visualize, plan and draw projections of lines (1D) and planes (2D) (inclined to both planes of projection)	3	1														
			CO3	Visualize and draw projections of regular solids (3D) (inclined to both planes of projection) and sections of regular solids (front view, top view and true shape)	3	2														
			CO4	Visualize and communicate 3D regular/irregular shapes as 2D engineering drawings and vice	3	1														
2	70125202	Engineering Mechanics	CO1	Determine the components of a force in rectangular or non-rectangular co-ordinates, determine resultants and apply conditions of static equilibrium to plane force systems.	3	-	-	-	-	-	-	-	-	-	-	-	-	-		
			CO2	Draw complete and correct free-body diagrams and determine resultants and apply conditions of static equilibrium to plane force systems.	3	-	-	-	-	-	-	-	-	-	-	-	-	-		
			CO3	Determine the support reactions of structures, recognize frictional forces acting on a body and analyze these forces	3	-	-	-	-	-	-	-	-	-	-	-	-	-		
			CO4	Applythe basic concepts of kinematics for the application of rectilinear motion	3	-		-	-	-	-	-	-	-	-	-	-	-		
			CO5	Apply the knowlwdge of Work-Energy principle and Impulse-Momentum principle.	3	-		-	-	-	-	-	-	-	-	-	-	-		
			CO6	Apply the basic concepts of dynamic equilibrium concept on Curvilinear motion																
2	70125205	Workshop Practice	CO1	To study and understand basic tools used at engineering workshop	3	-	-	-	-	-	-	-	1	-	-	1	-	-		
			CO2	To identify tools, work material and measuring instruments useful for fitting, welding, carpentry and plumbing practice.	3	1	-	-	-	-	-	-	1	-	-	1	-	-		
			CO3	To handle tools and instruments and use them to prepare simple models	3	-	-	-	-	-	-	-	1	-	-	1	-	-		
			CO4	Ability to undersatnd the engineering drawing and use them to prepare models	3	2	-	-	-	-	-	-	1	-	-	1	-	-		
2	70125206	Tinker Lab	CO1	Relate fundamental concepts/laws of science and engineering	2	1	-	-	-	-	-	-	3	1	-	1	-	-	1	-
			CO2	Practise pre-achieved skills on hardware and devices	1	-	-	-	-	-	-	-	1	1	-	1	-	-	1	-
			CO3	Take apart and reassemble and/or repairing of engineering gadgets	1	-	-	-	-	-	-	1	1	-	-	1	-	-	-	-
			CO4	Explore various aspects of tinkered devices/instruments	1	-	-	-	-	-	-	-	2	-	-	2	-	-	-	-
			CO5	Design and make models out of creativity using raw material	1	-	-	1	-	-	-	-	3	2	-	-	-	-	-	-
2	70125209	Software Tools	CO1	Develop a clear understanding about the need of convention standards in design process.	3	3	-	-	2	-	-	-	-	-	2	-	-	-	-	-
			CO2	Understand limits, fits, dimensional and geometric tolerances. Understand the types of fits used in engineering applications. Learn about surface roughness and its importance in engineering applications.	3	3	-	-	2	-	-	-	-	-	2	-	-	-	-	-
			CO3	Learning AutoCAD commands.	3	3	-	-	2	-	-	-	-	-	2	-	-	-	-	-
			CO4	Creating 2D part drawings using AutoCAD	3	3	-	-	2	-	-	-	-	-	2	-	-	-	-	-
			CO5	Creating 2D assembly drawings with BOM using AutoCAD	3	3	-	-	2	-	-	-	-	-	2	-	-	-	-	-
3	70125301	Measurement and Metrology	CO1	Understand basic concepts of metrology, measurement system, characteristics of measuring instruments, sources of error in measurement standards, calibration of measuring instruments,	3	2	-	-	-	-	-	-	-	-	-	2				
			CO2	Understand various linear measuring devices, angular measuring devices, geometric tolerances, limit gauges, design of limit gauges and comparators.	3	2	2	-	-	-	-	-	-	-	-	2				
			CO3	Understand and apply concepts of surface metrology,gear metrology, screw thread metrology, CMM and interferometers	3	2	-	-	-	-	-	-	-	-	-	2				
			CO4	Understand construction and working of different pressure, temperature and flow measuring devices.	3	-	-	-	-	-	-	-	-	-	-	2				
			CO5	Understand construction and working of different level, speed and sound measuring devices.	3	-	-	-	-	-	-	-	-	-	-	2				
			CO6	Understand construction and working of strain gauges and itsapplication in the measurement of force, torque, vibration and acceleration.	3	-	-	-	-	-	-	-	-	-	-	2				
3	70125302	Engineering Mathematics III	CO1	Use Cauchy's residue theorem, Cauchy's integral theorem and Cauchy's integral formula to evaluate contour integrals.	3	1	-	-	-	-	-	-	3	-	-	2				
			CO2	Represent the given function in Fourier integral representation, find Fourier transforms and inverse Fourier transforms.	3	2	-	-	-	-	-	-	3	-	-	2				
			CO3	Apply Z-transform to solve difference equations.	3	2	-	-	-	-	-	-	3	-	-	2				
			CO4	Describe the nature of partial differential equations and solve partial differential equations.	3	3	-	-	-	-	-	-	3	-	-	2				
3	70125303	Engineering Materials and Metallurgy	CO1	Students will be able to identify binary alloy systems, interpret phase diagrams and judge the effect of alloying elements on properties of steel.	3	2	-	1	-	-	-	-	-	-	-	-	-	-	3	-
			CO2	Students will be able to identify suitable heat treatment method for material property modifications of metals and alloys.	3	2	1	-	-	-	-	-	-	-	-	-	-	-	3	-
			CO3	Students will be able to analyze and categorize the properties and applications of ferrous, non-ferrous and advanced engineering materials.	3	2	1	1	-	-	-	-	-	-	-	-	-	-	3	-
			CO4	Will be able to identify basic material characterization techniques.	3	2	2	-	-	-	-	-	-	-	-	-	-	-	3	1
			CO5	Understand and select solid state processing techniques such as powder metallurgy and its applications.	3	2	1	-	-	-	-	-	-	-	-	-	-	-	3	1
			CO1	Solve the various fluid static as well as kinematics problems appearing in the practical life.	3	3			2											
			CO2	Develop conservation laws for various to fluid flow problems.	3	3														

3	70125304	Fluid Mechanics	CO3	Develop non-dimensional analysis using Buckingham pi theorem and/or scale laws for various fluid flow problems	3	3			2											
			CO4	Analyze and evaluate various types of flows, related fluid losses appearing in flow through pipes.	3	3						2	2	2	2	2				
			CO5	Discover and evaluate the various fluid forces by applying the concept of boundary layer over basic geometries appearing in practical life and/or fluid applications	3	3						2	2	2	2	2				
			CO6	Build the fundamentals concepts required for compressible fluid flows and relevant systems	3															
3	70125305	Strength of Materials	CO1	Understand and apply knowledge of stresses & strains to various materials in engineering.	3															
			CO2	Develop an ability to resolve the forces applied on the system and able to draw Shear Force and Bending Moment Diagram.	2	2														
			CO3	Identify the intensity of bending stress and shear stress induced in various section of beam (i.e. I, C, T L, H sections, etc.)	3	2														
			CO4	Examine the intensity of torsional stress when the solid or hollow shaft is subjected to torsional moment.	3	2														
			CO5	Understand and apply knowledge of principal stress, principal strain and Theories of Failure.	3	2														
			CO6	Identify the slope and deflection of determinate beams and determine the radius of curvature and flexural rigidity.	3	2														
3	70125306	Engineering Thermodynamics	CO1	Understand and apply the thermodynamic fundamentals to various thermodynamic processes	2	1	-	-	-	-	-	-	3	1	-	1	2	-	1	-
			CO2	Identify general equation for entropy and apply it to basic thermodynamic system like engine, refrigerator, etc.	1	-	-	-	-	-	-	-	1	1	-	1	2	-	1	-
			CO3	Understand and explain application of air standard cycle like, I.C. Engine.	1	-	-	-	-	-	-	1	1	-	-	1	2	-	-	-
			CO4	Identify various steam properties and its thermodynamics relations.	1	-	-	-	-	-	-	-	2	-	-	2	2	-	-	-
3	70125307	Fluid Mechanics Lab	CO1	Describe the losses occurring when flow takes place through pipes with different materials, velocities and roughness values	3	3			2											
			CO2	Demonstrate an understanding of the ship stability by deciding its metacentric height.	3	3														
			CO3	State the effect of Reynolds number on the flow phenomena in closed conduits	3	3			2											
			CO4	Undertake calibration of flow measuring devices like orifice plate and venturimeter and study their performance	3	3						2	2	2	2	2				
			CO5	Perform systematic experiments to understand/verify Bernoulli's theorem	3	3						2	2	2	2	2				
			CO6	Demonstrate an understanding of the electrical analogy method for applications involving flow/velocity determinations in a fluid flow situation	3															
3	70125308	Measurement and Metrology Lab	CO1	Understand application of different linear and angular measuring devices.	3	2	-	-	-	-	-	-	-	-	-	2				
			CO2	Understand application ofslip gauges, limit gauges and comparators.	3	2		-	-	-	-	-	-	-	-	2				
			CO3	Understand application offloating carriage micrometer and gear tooth vernier caliper to measure screw thread and gear tooth parameters respectively.	3	2	-	-	-	-	-	-	-	-	-	2				
			CO4	Understand application ofoptical flat, optical projector / toolmaker microscope.	3	-	-	-	-	-	-	-	-	-	-	2				
			CO5	Study of CMM and its applications.	3	-	-	-	-	-	-	-	-	-	-	2				
			CO6	Study of different pressure measuring instruments and its applications.	3	-	-	-	-	-	-	-	-	-	-	2				
			CO7	Study of different temperature measuring instruments and its applications.	3	-	-	-	-	-	-	-	-	-	-	2				
			CO8	Study of different flow / level measuring instruments and its applications.	3	-	-	-	-	-	-	-	-	-	-	2				
			CO9	Study of different speed / strain measuring instruments and its applications.	3	-	-	-	-	-	-	-	-	-	-	2				
			CO10	Understand applications of measuring instruments in the industries.	3	-	-	-	-	-	-	-	-	-	-	2				
3	70125309	Strength of Materials Lab	CO1	Conduct a tensile test on a mild steel and tor steel specimens to determine the yield strength, ultimate strength, young's modulus of elasticity, percentage elongation, percentage reduction in area.	3	2														
			CO2	Conduct a compression test on wood to determine the yield strength, ultimate strength, young's modulus of elasticity, percentage deformation.	2	2														
			CO3	Conduct and measure the hardness value of different material specimens using Rockwell, Brinell and Vicker hardness tester.	3	2														
			CO4	Study the behavior of the wooden specimen under bending and to determine elastic strength, moment of resistance, modulus of elasticity, modulus of rupture.	3	2														
			CO5	Determine toughness of material that is ability of material to absorb energy during plastic deformation by conducting Izod impact test in the laboratory.	3	2														
			CO6	Measure the effect of single and double shear on riveted and welded plates using shear fixture on UTM.	3	2														
			CO7	Measure the twisting capacity of steel rods using digital torsion testing machine.	3	2														
3	70125310	Engineering Thermodynamics Lab	CO1	Understand and apply the thermodynamic fundamentals to various thermodynamic processes	2	1	-	-	-	-	-	-	3	1	-	1	2	-	1	-
			CO2	Identify general equation for entropy and apply it to basic thermodynamic system like engine, refrigerator, etc.	1	-	-	-	-	-	-	-	1	1	-	1	2	-	1	-
			CO3	Understand and explain application of air standard cycle like, I.C. Engine.	1	-	-	-	-	-	-	1	1	-	-	1	2	-	-	-
			CO4	Identify various steam properties and its thermodynamics relations.	1	-	-	-	-	-	-	-	2	-	-	2	2	-	-	-
4	70125401	Service Learning	CO1	Illustrate the goals and understand importance of service learning activities in day today life.		2		1	1	3		3		3	1	3				
			CO2	Discuss the problems and possible solutions of different communities like rural communities, school children, old age groups etc.		3	1	2		2	3	2	1	3		2				
			CO3	Explain the objectives, methodology, implication and obstacles of service learning activity in order to know the suitable method to solve various issues of communities.	2		2		1	2	3	2	1		2	1				
			CO4	Construct and design the project and explain the importance of the project and discuss the possible outcomes and assign tasks to students.	1	2	3	3	1	1	3	2	3	1	3	3				
			CO5	Engage students in projects and community based practices to solve the real world problems using their engineering skills.		1	1			3	2	3	3	3	2	3				
			CO6	Students, faculties, communities, and organizations will take part in modifying, implementing, and recommending the best solution to solve the problem associated with different communities.	2		3		2		3	3	3	3	3	3				

4	70125402	Manufacturing Technology	CO1	Understand the basics of Theory of Metal Cutting and Reciprocating Machines.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO2	Understand Elements, tools and Basics of different casting process.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO3	Understand Elements, tools and Basics of different Joining process.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO4	Understand Elements, tools and Basics of different hot and cold working process.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	70125403	Theory of Machines I	CO1	Understand the importance of the study of mechanisms machine in mechanical engineering.	3	2	1	-	-	-	-	-	2	-	-	-	-	-	-	-
			CO2	Develop kinematic diagrams of the real life mechanisms & identify it's degrees of freedom	2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-
			CO3	Analyze the given mechanisms for velocity & Acceleration of different points and links using vector polygon approach.	2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
			CO4	Design required cam profile for the required output motion for various types of follower motions.	2	2	3	1	-	-	-	-	-	-	-	-	-	-	-	-
			CO5	Understand benefits and limitations of belts, ropes and chain drives and suggest the suitable drive for give application.	3	2		1	-	-	-	-	-	-	-	-	-	-	-	-
			CO6	Understand the concept of positive drive and suggest the applications where gears should be	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
4	70125404	Statistics, Probability and Numerical Methods	CO1	Use numerical methods to solve algebraic and transcendental equations.	3	3	-	-	-	-	-	-	3	-	-	2				
			CO2	Apply interpolation formulae to predict the value of any intermediate term and evaluate	3	3	2	1	-	1	-	-	3	-	-	2				
			CO3	Determine numerical solutions of ordinary differential equations.	3	3	2	1	-	1	-	-	3	-	-	2				
			CO4	Calculate measures of dispersions, coefficient of variation, coefficient of correlation.	3	3	2	1	-	1	-	-	3	-	1	2				
			CO5	Estimate the value of dependent variable using regression analysis.	3	3	2	1	-	1	-	-	3	-	1	2				
			CO6	Compute probabilities using probability distributions (discrete and continuous).	3	3	3	2		1	1		3			2				
4	70125405	Heat Transfer	CO1	To understand the basic laws of heat transfer.	3	2	2	1	1	1				1						
			CO2	Understand and use of conductive heat transfer, minimum thickness of insulation. Develop solutions for transient heat transfer in simple geometries	3	2	3	2	2	1						1	1	1	3	2
			CO3	Understand and use convective heat transfer. Analyse and apply empirical correlations in connection with the heat transfer at convection	2	3	2	3	3	2	1			1		3	1		3	
			CO4	Understand and use radiative heat transfer	3	3	3	2	2	2				1		2				
			CO5	Perform basic heat exchanger calculations and implement heat exchanger designs.	2	3	3	3	3	2	1									
4	70125406	Entrepreneurship Venture	CO1	To familiarize the students with basics of entrepreneurship, its advantages & challenges		1	1	1		1			2	-	-	-				
			CO2	To understand foundation of starting a business – from generating an idea to its implementation	-	2	3	2	2	1	1	1	2	2	3	-				
			CO3	To identify various institutions supporting business ventures including government support	-		1	-	2	1	-	-	1	-	2	-				
4	70125407	Heat Transfer Lab	CO1	To understand the importance and effect of various modes of heat transfer	3	2	-													
			CO2	Perform an experiment for finding the thermal conductivity of metal rod and insulating powder	3	2														
			CO3	Compare between natural convection and forced convection through experimentations	3	2														
			CO4	Discuss the distribution of temperature along the length of a pin fin and its usage in practical applications	3	2														
			CO5	Perform experiments on radiation to find the Stefan boltzmann's constant and emissivity of a metal surface	3	2														
			CO6	Compare the effectiveness of parallel flow and counter flow heat exchangers	3	3														
4	70125408	Manufacturing Technology Lab	CO1	Understand and observe the mechanism of various components, accessories and working of conventional machines such as lathe, drilling, grinding and shaping machines.	3	2	-	-	-	-	-	-	-	--	-	-	-	-	-	-
			CO2	Apply the basic knowledge to produce engineering components and study various operations performed.	3	2	-	-	-	-	-	-	-	--	-	-	-	-	-	-
			CO3	Identify the significance of non-conventional machining over conventional.	2	2	-	-	-	-	-	-	-	--	-	-	-	-	-	-
4	70125409	Theory of Machines-I Lab	CO1	Understand the importance of the study of mechanisms machine in mechanical engineering.	3	2	1	-	-	-	-	-	2	-	-	-	-	-	-	-
			CO2	Develop kinematic diagrams of the real life mechanisms & identify it's degrees of freedom	2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-
			CO3	Analyze the given mechanisms for velocity & Acceleration of different points and links using vector polygon approach.	2	3	2	2	-	-	-	-	-	-	-	-	-	-	-	-
			CO4	Design required cam profile for the required output motion for various types of follower motions.	2	2	3	1	-	-	-	-	-	-	-	-	-	-	-	-
			CO5	Understand benefits and limitations of belts, ropes and chain drives and suggest the suitable drive for give application.	3	2		1	-	-	-	-	-	-	-	-	-	-	-	-
			CO6	Understand the concept of positive drive and suggest the applications where gears should be preferred over belts and rope drives.	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
4	70125410	Statistics, Probability and Numerical Methods lab	CO1	Use Matlab Built in functions to carry out matrix operations. Calculate Eigen values, Eigen vectors using MATLAB.	2	2	-	-	3	-	-	-	3	-	-	2				
			CO2	Compute solution of system of simultaneous equations by gauss elimination.	3	3	2	-	3	-	-	-	3	-	-	2				
			CO3	Write a code to evaluate numerical interpolation, differentiation and integration.	3	3	1	-	3	-	-	-	3	-	-	2				
			CO4	Find numerical solution of ordinary differential equations using Matlab code.	3	3	1	-	3	-	-	-	3	-	-	2				
			CO5	Write Matlab code for solving partial differential equations using finite difference methods.	3	3	2	-	3	-	-	-	3	-	-	2				
			CO6	Use R software to carry out statistical computations	2	3	3	1	3	1	-	-	3	-	1	2				
			CO1	Understand and apply the IC Engines fundamentals to various thermodynamic processes	2															
			CO2	Illustratethe need and importance of study of Internal combustion engine for mechanical engineers.	3	1														
			CO3	Identify and compare the relative merits, demerits and applications of different systems and components in an engine.	2															
			CO4	Explain the functioning of Fuel system in SI and CI Engine and identificationof advanced systems in engine such as Electronic ignition system, M.P.F.I. system etc.	3	2		2				1								

5	70125501	I.C. Engines	CO5	limitations.	2															
			CO6	Discuss different types of air charging systems.	1							1								
			CO7	Discuss the construction and working of different supporting systems such as ignition system, engine cooling system, lubrication system, governing system etc.	3			1				1								
			CO8	Explain the combustion phenomenon in the IC engine and discuss the effect of air-fuel ratio on the combustion in the IC engine.	2			2												
			CO9	Importance of cooling and lubrication system in the automobile, illustrate different types of cooling and lubrication system and explain the working of lubrication system.	3			1												
			CO10	Discuss the importance of testing of an engine such as fuel consumption rate, brake power, indicated horsepower and friction, horse power, performance of S.I. and C.I. Engine and demonstrate and experiment with dynamometer.	2	2		2	2	2	2	1	2			1				1
			CO11	Explain the effect of various exhaust gases on the emission and demonstrate how to minimize them by using different solution such as catalytic convertor, EGR, Fuel injection timing, Fuel injection pressure, etc.	2			2	2	3	3	3	2	2	1	2	1	2	1	2
5	70125502	Machine Design - I	CO1	The student can able to understand and analyze the different stresses on mechanical components.	2	3	3	2												
			CO2	Identify the proper materials and factor of safety for design and development of engineering power transmitting devices.	2	1	3	2												
			CO3	Understand design & applications of various types of springs	3	1	2	2												
			CO4	Understand design and applications of mechanical fasteners and permanent joints.	3	1	3	2												
			CO5	Power screw applications and their efficiency.	3	1	1	2												
5	70125503	Mechatronics	CO1	Explain the characteristics of transducers, sensors and measuring devices and Interpret the factors that contribute to errors in measurements, such as non-linearity, hysteresis and dead band.	1	-	-	-	-	-	-	1	1	-	-	1				
			CO2	Understand and analyze different transducers such as LVDT, thermocouples, thermistors, and electromagnetic flow meters, measurement of speed, pressure and level.	3	2	-	1	1	-	-	1	1	-	-	1				
			CO3	Understanding basic electronics of signal conditioning.	1	-	-	-	3	-	-	1	1	2	-	1				
			CO4	Comprehend the concept of PLC system and its ladder programming, and significance of PLC systems in industrial application.	3	1	-	1	3	-	-	1	1	2	-	1				
			CO5	Illustrate distributed control systems, hierarchical control systems and examine its applications in the process control industry.	3	-	-	-	-	-	-	1	1	-	-	1				
5	70125504	Advanced Manufacturing Technology	CO1	Understand and differentiate conventional and non-conventional machining process	3	3														
			CO2	Understand various Advanced casting, welding, and metal forming process	3	3	2		1											
			CO3	Understand the basics of additive manufacturing and micro machining				1	1											
			CO4	Understand the basics of Micro machining Robotics and 3D printing			1	1	1											
5	70125507	Project Based Learning I	CO1	Understand the Reverse Engineering (RE) Methodology.	3	1							2							
			CO2	Disassemble products and specify the interactions between its subsystems and their functionality.	2	2	2	1		1		1				2	2			
			CO3	Understand Computer-Aided RE and Rapid Prototyping Technology.	2	2	1		3				2			2				
			CO4	Understanding of Reverse engineering of Systems, Mechanical RE, Electronic RE, and Computer RE.	2	2	1		2	1			2			2				
5	70125508	I.C. Engines Lab	CO1	Illustrate andunderstandthe need and importance of study of internal combustion technologies.	2	1		1		1	2	1				2				
			CO2	Explain the different Engine technologies such as electronic ignition system, M.P.F.I. DTSI, TDI, CDI system etc.	2	1	1	2	1		2					2				
			CO3	Discuss the importance of engine testing and demonstrate and experiment with dynamometer.	3	3	2	3	1	1	3	1	3		1	1				
			CO4	Explain the effect of various exhaust gases on the environment and demonstrate how to minimize them by using different techniques.	1	3		3	2	3	3	3	3	1		3				
5 Specialization : Automobile Engineering	70125509	Basics of Automotive Engineering	CO1	Illustrate and apply knowledge of automotive engineering to the day today automotive applications	3											3			3	
			CO2	Develop an ability to resolve the problems of automotive system and able to reach valid conclusion.	3	2		1								3			3	
			CO3	Illustrate and examine the components and functions of vehicle chassis system.	3		1									3			3	
			CO4	Illustrate and apply knowledge of basic principles of electronics and electrical engineering to electric vehicles.	3						2				1	3			3	
5 Specialization : Automobil	70125510	Automotive Engine and Transmission System	CO1	Outline basic concept of engine and its working of SI and CI engines.	3											3			3	
			CO2	Examine the importance of engine components, fuel supply, cooling and lubrication systems.	3	2										3			3	
			CO3	Interpret air motion and combustion chamber design.	3	2										3			3	
			CO4	Recall and Evaluate new engine technology and transmission system.	3	3		1								3			3	
5 - CAD/CAM	70125511	Basic and Advanced CATIA Lab	CO1	Understand sketcher profile toolbar, modification toolbar, constraining toolbar, iso constraining of sketches using sketcher module of CATIA.	3	1	--	---	3	---	---	---	---	---	---	2	---			
			CO2	Creation of solids with following toolbars in part design module of CATIA: Sketch based features, Dress up features, Reference elements etc.	3	3		---	3	---	---	---	---	---	---	2	---			
			CO3	Generate 2D drawings with dimensions, tolerances & surface finish from 3D model. Generate assembly drawings with BOM.	3	2		---	3	---	---	---	---	---	---	2	---			
			CO4	Prepare assembly models using top down and bottom up approach. Generate assembly constraints, flexible assemblies, use of patterns in assembly.	3	3		---	3	---	---	---	---	---	---	2	---			
			CO5	Understand 3D wireframe and 3D surface creation using Generative Shape Design module in CATIA. Learn surface operations toolbar, surface based features etc.	3	1	--	---	3	---	---	---	---	---	---	2	---			
			CO6	Learn Digital Mock Up (DMU) toolbar, creation of various joints, simulation of assemblies, kinematic analysis etc.	3	3			3							2				
5 - CAD/CAM	70125512	Computer Aided Manufacturing Lab	CO1	Learn about writing program in G & M codes for a turning centre.	2	1	--	--	2	--	--	---	--	---	---	2	---			
			CO2	Get hands on experience of writing and executing the program on a turning centre to machine few components.	2	1		--	2	--	--	---	--	---	---	2	---			
			CO3	Learn Master CAM/ Del CAM software to generate tool paths for turning operations	2	1		--	2	--	--	---	--	---	---	2	---			

			CO4	Learn Master CAM/ Del CAM software to generate tool paths for milling operations	2	1		--	2	--	--	---	--	---	---	2	---			
			CO5	Learn to generate CAM programs for 3D milling	2	1	--	--	2	--	--	---	--	---	---	2	---			
5 - CAD/CAM	70125513	Manufacturing Engineering	CO1	Understand about dimensional tolerances and geometric tolerances used on industrial parts.	3	3	--	--	3	--	--	---	--	---	---	3	---			
			CO2	Understand the types of fits used on assemblies, importance of surface finish etc.	3	3		--	3	--	--	---	--	---	---	3	---			
			CO3	Learn machine level programming of CNC machines using G & M codes. Learn APT programming language for CNC tool paths	3	3			3							3				
5 - Design of Heat Exchanger	70125514	Advanced Fluid Mechanics	CO1	Aims to give students a deeper and more thorough grounding in principles and basic applications of fluid mechanics.	3	3	3													
			CO2	Student can understand the mathematical and physical foundations of the continuum mechanics of fluids, including conservation laws; viscous, inviscid, incompressible flows; boundary layer theory.	3	3	3		3										2	2
			CO3	components, using computational fluid dynamics, including avoiding common pitfalls related to	3	3	3		3				3		3	3			2	2
			CO4	Student can able to apply the principles of fluid mechanics to solve heat exchangers problems and to design systems or components to meet desired needs; including (a) to idealize a system or component for the purposes of fluid mechanical analysis; (b) to use appropriate numerical and analytical techniques to model the system (c) to interpret and draw appropriate conclusions from the results (d) present results and conclusions clearly in the written and oral presentations, and (e) critically evaluate the approximations underlying the idealization	3	3	3	3	3				3		3	3			2	2
5 - Design of Heat Exchanger	70125515	Basics of Heat Exchanger	CO1	Understand the principles of heat transfer and fluid flow in heat exchangers.	3	2	2			2							3		3	
			CO2	Learn to select appropriate Heat Exchanger for the given application	3	3	3		3							2	3		3	
			CO3	Become aware of single and multiphase heat transfer and friction coefficient correlations, and they will know how to select the appropriate	3	3	3		3				3		3	3	3		3	2
			CO4	Learn how to consider fouling of surfaces, incorporate fouling in designs, and handle fouling during heat exchanger operation	3	3	3	3	3				3		3	3	3		3	2
5 - Design of Heat Exchanger	70125516	Materials and Fabrication Processes for Heat Exchanger	CO1	Understand the concept of mechanical behavior of materials and calculations of same using appropriate equations Understanding	3	2	2			2										
			CO2	Explain the concept of phase & phase diagram & understand the basic terminologies associated with metallurgy. Construction and identification of phase diagrams and reactions Understanding,	3	3	3		3							2			2	2
			CO3	Understand and suggest the heat treatment process & types. The significance of properties Vs microstructure. Surface hardening & its types. Introduce the concept of hardenability & demonstrate the test used to find hardenability of steels.	3	3	3		3				3		3	3			2	2
			CO4	Understanding, Evaluatingfeatures, classification, applications of newer class materials like smart materials, piezoelectric materials, biomaterials, composite materials etc.	3	3	3	3	3				3		3	3			2	2
			CO5	Different manufacturing process use for heat exchanger fabrication.	1	2	3	2					3		2	2			2	2
5 - Industry 4.0	70125518	Sensors and Transducers Technology	CO1	Select the right sensor for a given application.	2	2	2													
			CO2	Design basic circuit building blocks.	2	2	2													
			CO3	Simulate, synthesize, and layout a complete sensor or sensor system, MEMS device or microsystem ready for fabrication tools	2	2	2													
5 - Industry 4.0	70125519	Digital Signal Processing	CO1	Understand the significance of digital signal processing in multi-media technology, storage and communications.	2															
			CO2	Knowledge of digital filters and their application to digitised sound and images.	2															
			CO3	Understand how FIR and IIR type digital filters: may be designed and implanted in software.	2	2														
			CO4	Understand analogue/digital conversion as required for the digital processing of analogue signals.	2															
5 - Industry 4.0	70125520	Microcontrollers and Embedded Systems	CO1	Learn basic hardware of various microcontrollers.	2															
			CO2	Assembly and programming concepts, jump and call instructions.	2															
			CO3	Hardware interfacing of microcontroller with led's,	2	2														
5	70125521	Theory of Machines - II	CO1	Conduct the dynamic forces analysis of a basic mechanism.	2	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO2	Understand turning moment diagrams of engines for speed fluctuation & power smoothening using flywheels.	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO3	Understand unbalancing of rotating masses.	2	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO4	Understand the process of speed control by using governors.	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO5	understand the concept of the gyroscopic couple on the stability of aeroplanes and automobiles.	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO6	Ability to understand the fundamentals of vibration and Noise	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	70125522	Fluid Machinery	CO1	----------Interpret the dynamic action of liquid jets in developing motive forces on objects having different geometries in both stationary and moving modes. Apply the governing equations to determine force, work, power and efficiency for plain and curved surfaces	3	3	-	1												
			CO2	Explain the concept of hydrodynamic machines and various efficiencies	3	3	-	1												
			CO3	Understand the components and working of impulse and reaction turbines and Apply the governing equations to determine work, power and efficiency of impulse and reaction turbines.	3	3		1												
			CO4	Illustrate the concept of specific speed and unit quantities as applied to turbines and pumps, cavitation and its effects	2	3														
			CO5	Explain the construction of centrifugal pumps. Make use of the governing equations for head developed, power and efficiency of centrifugal pumps	3	3														
			CO1	To gain an understanding and appreciation of the principles and applications relevant to the planning, design, and operations of manufacturing/service firms	2															
			CO2	To understand various layout in an organization and its importance	3	2														

5	70125523	Production Management	CO3	Explain the importance of forecasting and ddemonstrate the ability to apply some mathematical forecasting techniques	3	2														
			CO4	Importance of demand in capacity planning and aggregate planning, their techniques and utilization in industry	3	2														
			CO5	Illustrate the different concepts of production planning and control (PPC) and define the functions of PPC	3	2														
			CO6	Demonstrate the concept of TPM and illustrate various maintenance techniques	3															
5	70125524	Theory of Machines - II Lab	CO1	Conduct the dynamic forces analysis of a basic mechanism.	2	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO2	Understand turning moment diagrams of engines for speed fluctuation & power smoothening using flywheels.	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO3	Understand unbalancing of rotating masses.	2	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO4	Understand the process of speed control by using governors.	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO5	understand the concept of the gyroscopic couple on the stability of aeroplanes and automobiles.	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
			CO6	Ability to understand the fundamentals of vibration and Noise	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	70125525	Fluid Machinery Lab	CO1	Discuss the working of Pelton turbine and perform systematic experiments to establish its characteristics inclusive of power and efficiency under different operating modes	3	3	-	1												
			CO2	Explain the working of Francis turbine and perform systematic experiments to establish its characteristics inclusive of power and efficiency under different operating modes	3	3	-	1												
			CO3	Discuss the working of Kaplan turbine and perform systematic experiments to establish its characteristics inclusive of power and efficiency under different operating modes.	3	3	-	1												
			CO4	1. Explain the working of centrifugal pump and perform systematic experiments to establish its characteristics inclusive of head, flow rate, power and efficiency under different operating speeds.	3	3	-	1												
5	70125526	Production Management Lab	CO1	Explain the importance of forecasting and demonstrate the ability to apply some mathematical forecasting techniques	3	3	2	2	1	2										
			CO2	Importance of demand in capacity planning and aggregate planning, their techniques and utilization in industry	3	3	3	3					2	2						
			CO3	Illustrate the different concepts of production planning and control (PPC) and define the functions of PPC	3	3	3	1	2					3	3	3				
			CO4	Understand and develop plant layout	3	3	3	3	1				2							
			CO5	Understand and implement the concepts of work study and time study	3	3	3	3	2					3	3	3				
5	70125527	Engineering Design Optimization	CO1	----------Understand the importance of optimization techniques in engineering.	3										1					
			CO2	Apply basic concept of mathematics to formulate the optimization problems.	3	3									2					
			CO3	Select and apply appropriate classical optimization methods for one-dimensional and multi-dimensional problems.	3	3	2								1					
			CO4	Construct and solve constraint optimization problems.	3	3	3								3					
			CO5	Apply optimization techniques to various engineering applications.	3	3	3	1							3					
5	70125528	Industrial Fluid Power	CO1	Explain the different components used in a fluid power system and----------illustrate the basic principles and working of various hydraulic machines.	3	-	-	-	-	-	-	1	1	-	-	2				
			CO2	----------Explain the principle of working and constructional details of pumps.Select pump for hydraulic power transmission based on the characteristic curves and efficiency of pump.	3	1	-	-	-	-	2	1	1	-	-	2				
			CO3	Interpret the necessity of fluid control through direction control valve, pressure control valve and flow control valve.	3	1	-	-	-	-	-	1	1	2	-	2				
			CO4	Draw hydraulic and pneumatic circuits for practical applications.	3	3	1	1	-	-	-	1	1	2	-	3				
			CO5	Explain the principle working of pneumatic system.	3	1	-	-	-	-	2	1	1	-	-	2				
			CO6	Demonstrate the needed analytical skills in handling basic hydraulic and pneumatic	3	1	1	1	-	-	2	1	1	2	-	-				
5	70125529	Composite Materials	CO1	Identify and explain the types of composite materials and their characteristic features	3	2	1	-												
			CO2	Understand the differences in the strengthening mechanism of composite and its corresponding effect on performance and application	3	2	-	-												
			CO3	Understand and explain the methods employed in composite fabrication	3	3	3	1												
			CO4	Appreciate the theoretical basis of the experimental techniques utilized for failure mode of composites	3	3	3	1												
			CO5	Equip them with knowledge on how to fabricate and carry out standard mechanical test on composites	3	2	2	-												
6	70125601	CAD & CAM	CO1	Acquire fundamental understanding about the product cycle using CAD/CAM and the role of hardware and software in this process.																
			CO2	Understand mathematical representation of curves and surfaces and their application																
			CO3	Understand various geometric modeling representations and to apply engineering mathematics(related to matrices)to understand transformation systems																
			CO4	Understand and apply computer aided manufacturing principles to perform NC programming																
			CO5	Understand integrated manufacturing, flexible manufacturing systems andgroup technology to realize use of computers in manufacturing industry																
		Project Based	CO1	To enhance students' knowledge and skills working on experimental setup for labs.	3	1														
			CO2	Would have undergone real-time hands-on projects by identifying required equipments for various laboratories at institute.	2	3	1			1			1			2	2			

6	70125603	Project Based Learning II	CO3	to think out of the box, look at the world around them, identify formulate, and solve engineering problems	2	2	1						2			2	1			
			CO4	Develop creative solutions to problems and conceive innovative approaches in developing and designing of mechanical systems and machines	2	2	1			1			2			2	1			
6	70125606	CAD& CAM Lab	CO1	Understand and apply various sketching commands to make a 2D sketch by using sketch module in CAD software.	3	2	--	---	3											
			CO2	Understand and apply various basic commands like extrude, hole, chamfer, revolve etc. to make a 3D drawing using part module of CAD software.	3	2		---	3											
			CO3	Prepare Front, top and side view of a 3D model (with dimensions) using drafting (drawing) module of CAD software.	3	2		---	3											
			CO4	Prepare assembly of mechanical components using assembly module of CAD software.	3	3		---	3											
			CO5	Generate assembly drawings with bill of material.	3	3	--	---	3											
6 Specialization : Automobile Engineering	70125607	Instrumentation and Automotive Electronics	CO1	Illustration of various instrumentation and control detection circuits as they relate to temperature, pressure, flow, and level monitoring of various processes.	3											1			3	
			CO2	Find various data acquisition systems, and converters relevant to instrumentation and its applications	3											1			3	
			CO3	Outline professional measurement techniques used to engineer thermal and mechanical systems.	2	1													3	
			CO4	Summarize data acquisition systems and their components including A/D converters and their characteristics and limitations.	2														3	
			CO5	Recall the fundamental elements of instrumentation, measurement and control systems.	3									1	1	1			3	
			CO6	system for mechanical application.	2	1														
6 Specialization : Automobile Engineering	70125608	Vehicle Dynamics and NVH	CO1	Comparison vibrating systems and its analysis, modelling and simulation and modal analysis.																
			CO2	Importance various Suspension systems, selection of springs and dampers	3	2										3			3	
			CO3	Evaluate the stability of vehicles on curved track and slope, gyroscopic effects and cross wind handling.	3	2										3			3	
			CO4	Recall about tyres, ride characteristics and effect of camber, camber thrust	3	3										3			3	
			CO5	vehicles.	3	3										3			3	
			CO6	Simplify and analyse the various dynamic aspects of the vehicle.	3	3										3			3	
			CO7	Relationship between sound measurement and human sensitivity.	3	3										3			3	
6 Specialization : CAD/CAM	70125609	Computer Aided Design II Lab	CO1	Understand sketcher profile creation tools, modification tools, constraining toolbar, iso constraining of sketches using sketcher module of NX	3	1	--	---	3	---	---	---	---	---	---	2	---		3	
			CO2	Creation of solids with various tools in part design module of NX: Extrude, Extrude cut, Revolve & Revolve cut, Sweep, Multi section solids. Creating various types of patterns, Creating planes, Rounds, Chamfers etc. Editing of solids, Parent child relationship	3	3		---	3	---	---	---	---	---	---	2	---			
			CO3	Generate 2D drawings with dimensions, tolerances & surface finish from 3D model. Generate assembly drawings with BOM.	3	2		--	3	--	--	--	--	---	---	2	---			
			CO4	Prepare assembly models using top down and bottom up approach. Generate assembly constraints, flexible assemblies, use of patterns in assembly.	3	3		---	3	---	---	---	---	---	---	2	---			
			CO5	Understand 3D wireframe and 3D surface creation using NX. Learn surface operations toolbar, surface based features etc.	3	1	--	--	3	--	--	--	--	---	---	2	---			
			CO6	Generate tool paths for turning, milling, drilling, boring etc. using NX manufacturing. Generate G & M codes for CNC machining	3	3			3							2				
6 Specialization : CAD/CAM	70125610	Structural Dynamic Analysis Lab	CO1	Design and analyze 1D dynamic problem using commercial software, and compare results with classical solutions.	3	1	2		3											
			CO2	Design and analyze 2D problems using ANSYS, commercial software, and compare results with classical solutions.	3	1	2		3											
			CO3	Prepare 3D model of a part and analyze it using ANSYS.	2	1	3	2	3											
			CO5	Formulate buckling problem using ANSYS and evaluate modal frequencies.	3	1	3		3											
			CO4	Formulate time-dependent and harmonic problem using ANSYS.	3	2	3	2	3											
			CO6	Design and analyze the machine component for structural dynamics	3	2	3	3	3											
6 - Design of Heat Exchanger	70125612	Numerical Methods for Heat Exchanger	CO1	Develop proficiency in the application of the finite element method (modelling, analysis, and interpretation of results) to realistic heat exchanger problems through the use of a major commercial general-purpose finite element code.	3	3	3	2		2										
			CO2	Learn the theory and characteristics of finite elements that represent heat exchanger structures.	3	3	3		3											
			CO3	Learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.	3	3	3	2	3	2			3		3	3			2	3
			CO4	Learn to model complex geometry problems and solution techniques related heat exchanger.	3	3	3	3	3				3		3	3			2	3
6 Design of Heat Exchanger	70125613	Heat Exchanger Simulation Lab	CO1	Design and analyze 1D heat exchanger problem using commercial software, and compare results with classical solutions.	3	2	2			2									2	3
			CO2	Design and analyze heat exchanger problems using ANSYS, commercial software, and compare results with classical solutions.	3	3	3		3							2			3	3
			CO3	Prepare a 3D model of different types of the heat exchanger and analyze it using ANSYS.	3	3	3		3				3		3	3			3	2
			CO4	Formulate dynamic problem using ANSYS and evaluate modal frequencies.	3	3	3	3	3				3		3	3			3	3
6 - Industry 4.0	70125614	Computer, System, Technologies For Enabling Industry 4.0	CO1	Understand basic sensor network concepts.	2															
			CO2	Know physical layer issues, Medium Access Control Protocols	2															
			CO3	Comprehend network and transport layer characteristics and protocols.	2															
			CO4	Understand the network management and Middleware services	2															
6 - Industry 4.0	70125615	Industrial Internet of Things	CO1	Learn basics about the IIOT.	2															
			CO2	Cryptography and access management concepts, jump and call instructions.	2															
			CO3	Privacy and cyber security	2															

4.0			CO4	Cloud Computing introduction	2															
6 - Industry 4.0	70125616	Industrial Robotics	CO1	Design and build a robotic workcell satisfying provincial safety requirements including standard industrial interlocks.	2	2														
			CO2	Design and build a pneumatically controlled pick-and-place robot, and program its operation using PLCs (programmable logic controllers).	2	2	2													
			CO3	Specify and install various types of industrial sensors including microswitches, reed switches, proximity detectors, and optical sensors.	2	2	2													
			CO4	Assemble, calibrate, program, and operate a machine vision system.	2	2	2													
			CO5	Operate, control, and program an industrial revolute- coordinate continuous-path robot.	2	2														
			CO6	Program industrial robots to perform complex motions and paths	2	2	2													
			CO7	Program robots to interact with external devices and systems	2	2	2													
			CO8	Specify industrial motors for motion	2															
6	70125617	Finite Element Methods	CO1	Develop the ability to generate the governing (differential equations) equations for mechanical systems and implement the basic finite elements procedures for structural and thermal applications using truss and beam elements.	3	3	1		2											
			CO2	Identify and apply the mathematical tools from algebra, calculus and numerical methods for the solution of finite element problems.	3															
			CO3	Determine the engineering design concepts required to numerically analyze the stresses, strains and deformation of a structure under either plane-stress or plane-strain conditions.	3	3	1		2											
			CO4	Investigate and model numerically the multi-dimensional structural and heat transfer problems using Finite Element Method (FEM). Also use CAD/CAE software to solve the proposed models.	3	3	3		2											
			CO5	Apply knowledge and skills from mechanics and numerical methods to effectively evaluate dynamic problems.	3	3	3		1											
6	70125618	Computational Fluid Dynamics	CO1	Develop basic governing equations for fluid and heat flow by examining the physical boundary conditions.	3	3	3		2											
			CO2	Construct finite difference based equations according to the nature (i.e. elliptic, parabolic and hyperbolic) of the flow problem.	3	3	3													
			CO3	Decide and implement various implicit and explicit CFD schemes to solve steady and unsteady 1/2/3 dimensional fluid problems.	3	3	3		2								3			3
			CO4	Analyze and evaluate various finite volume based CFD schemes to solve convection-diffusion problems	3	3	3					2	2	2	2	2	3			3
			CO5	Solve incompressible flow problems with considerations of geometry, mesh, flow physics, physical boundary conditions, turbulence, etc.	3	3	3		3			2	2	2	2	2	3			3
6	70125619	Jigs and Fixtures	CO1	Understand and differentiate between the applications of Jigs and Fixtures.	3															
			CO2	Apply their knowledge in selection of proper work holding devices for manufacturing process.	3	2			2											
			CO3	Design appropriate jigs and fixtures for different manufacturing operations.	3	3			3											
			CO4	Understand metal cutting tools and identify various tool parameters.	3	3														
			CO5	Apply the knowledge of fits and tolerances in design of jigs and fixtures.	2	2														
6	70125620	Finite Element Methods Lab	CO1	Design and analyze 1D structural problem using commercial software, and compare results with classical solutions.	3	3	1		2											
			CO2	Design and analyze beam problems using ANSYS, commercial software, and compare results with classical solutions.	3															
			CO3	Design and analyze 2D problems using ANSYS, commercial software, and compare results with classical solutions.	3	3	1		2											
			CO4	Prepare 3D model of a part and analyze it using ANSYS.	3	3	3		2											
			CO5	Formulate dynamic problem using ANSYS and evaluate modal frequencies.	3	3	3		1											
6	70125621	Computational Fluid Dynamic Lab	CO1	Develop and solve the numerical model for incompressible laminar flow.	3	3	3		3							2	3			
			CO2	Develop and solve the numerical model for incompressible turbulent flow.	3	3	3		3							2	3			
			CO3	Develop and solve the numerical model for flows involving heat transfer.	3	3	3		3							2	3			
			CO4	Translate mathematical models into numerical models by developing appropriate programs (C or MATLAB).	3	3	3		3							2	3			
			CO5	Develop and solve the numerical model for unsteady incompressible flow.	3	3	3		3							2	3			
			CO6	Develop and solve the numerical model for compressible laminar flow.	3	3	3		3							2	3			
6	70125622	Jigs and Fixtures Lab	CO1	Design and Draw different clamps and work holding devices for manufacturing process	3	2														
			CO2	Design and Draw different jigs for different manufacturing operations	2	2	3		1										1	
			CO3	Design and Draw different Fixtures for different manufacturing operations	3	3			3										1	
			CO4	Apply the knowledge of fits and tolerances in design of jigs and fixtures	2	2														
6	70125623	Machine Design II	CO1	Explain the general design procedure of clutches, brakes, flywheel, power screws	1															
			CO2	Design the bearings, clutches, brakes, flywheels, power screws		2														
			CO3	Discuss various types of drives	1	2														
			CO4	Explain the working, construction & applications of bearings	1															
			CO5	Differentiatebetween rolling and sliding contact bearings	1															
			CO6	Discuss the basics of spur, helical, bevel, worm and worm wheel gears		2														
			C07	Design of spur, helical, bevel, worm and worm wheel gears under static and dynamic loading		2	3													
			CO1	Classify and compare Steam, gas, Diesel and Hydro power plants, nuclear Power plants. Explain construction, and working of power plants. Explain siting considerations of power plants	3											2			3	
			CO2	Compare various types of reactors and explain site selection for reactor and waste disposal of the reactor	3											2			3	
			CO3	Classify various types of fuels used in thermal power plant and explain their handling, combustion etc. Explainash handling and dust collectionmechanism, principle of fluidized bed combustion	3											2			3	

6	70125624	Power Plant Engineering	CO4	Explain principle of Steam nozzles, variation of velocity and pressure, choking of nozzle, nozzle efficiency etc., Classify various types of nozzles and diffusers Explaineffect of friction, velocity coefficient, examine nozzle efficiency. Explain supersaturated flow.	3	2										2			3	
			CO5	Classify different types of condensers and explain Dalton's law of partial pressure, condenser efficiency, condenser vacuum and vacuum efficiency, etc. Illustrate construction of various types of condensers and explain their functioning etc. Analyze effect of air on condenser efficiency.	3	3										2			3	
			CO6	Compare different type of Steam turbines and explain their constructional details, losses, overall efficiency, etc. Analyze performance of steam turbines.	3	3										2			3	
			C07	Explain and analyze various economic factors associated with power generation like unit energy cost, load factor, plant capacity factor etc. Explain load curves and compare performance of different capacity power plants.	3	1										2			3	
6	70125625	Operations Research	CO 1	Formulate complex mathematical models from the verbal description of the real system in management science and industrial engineering using correct decision variables.	3	3	3	2	3	-	-	-	-	-	-	-	1	-	2	1
			CO 2	Identify and apply the mathematical tools from algebra and calculus for the solution methods for linear programming, transportation and assignment models. Also use mathematical software to solve the proposed models.	3	3	3	-	3	-	-	-	-	-	-	-	2	-	2	1
			CO 3	Understand and apply the concept of game theory to practical situations.	1	2	-	1	2	-	-	-	-	-	-	-	2	-	2	1
			CO 4	Develop proficiency with tools from probability, statistics and simulation, and apply them to the queuing situations in the service industry to minimize the customers / clients waiting period for service delivery.	2	3	3	-	3	-	-	-	-	-	-	-	2	-	2	1
			CO 5	Evaluate and review the network, determine the critical path and estimate the cost of the project.	-	3	3	-	3	-	-	-	2	-	3	-	1	-	2	1
6 -OE	70125635	Quality Management Techniques	CO1	Explain the various philosophies of evolution of quality and understands different dimensions of quality and quality tools.						3		3			2	2				
			CO2	Explain the importance of quality control and apply statistical techniques to measure quality control.						3					1	3				
			CO3	Describe ways of applying quality management in the actual Organization.						3		3			2	2				
			CO4	To apply various quality improvement techniques and to understand quality management system.						3		3			1	3				
6 - OE	70125636	Electrical and Electronics Materials	CO1	Students will be able to identify and interpret the material characterization techniques required	3	2	-	2	-	-	-	1	-	1	-	1	-		2	
			CO2	Students will be able to identify suitable conductive and resistive materials for electrical applications.	3	1	1	-	-	1	-	-	-	1	-	1	-		2	
			CO3	Students will be able to apply the knowledge of magnetic, dielectric and thermal properties of materials in design of electrical and electronic devises.	3	2	2	-	-	1	-	-	-	1	-	1	-		2	
			CO4	Students will be able to identify and apply the thin film technology in electronics and electrical applications.	3	2	1	-	-	-	-	-	1	1	-	1	-		2	
			CO5	Students will be able to differentiate between nano structured and bulk materials and apply the knowledge to electrical and electronics devise design.	3	1	2	-	-	-	-	-	1	1	-	1	-		2	
6 - OE	70125637	3D Printing and Prototyping	CO1	Understand what Advanced/Additive manufacturing (AM) is and understand important technology trends for product development and innovation.	3	3														
			CO2	Exhibit comprehensive knowledge of the broad range of AM processes, devices, capabilities and materials that are available.	3	2	2		1											
			CO3	Understand the various software's, processes and techniques that enable advanced/additive manufacturing and peculiar fabrication.	2	2		1	1											
			CO4	Learn how to make physical objects that fulfil product development/prototyping requirements, using advanced/additive manufacturing devices and processes.	2		1		1											
6 -OE	70125638	Project Management	CO1	Analyze various facets of a project and its management.	2	2														
			CO2	Develop project plan using appropriate technique like Gantt chart, CPM & PERT.		2	2		2				2							
			CO3	Understand human resource management in projects from both client and server point of views.		2		2		2		2	2							
			CO4	Select method for effective material management, express ethical practices in project management and restate general and special conditions of contract document.	2	2		2		2										
			CO5	Formulate budget, actual expenditures and profits in a project.	2	2						2	2			3				
6 - OE	70125639	Nanotechnology	CO1	understand the concept of nanoscale materials and quantum effects governing the bel	2	2	-	-	-	-	-	-	-	-	-	2				
			CO2	understand the nature and properties of nanomaterials.	2	-	-	-	-	-	-	-	-	-	-	2				
			CO3	describe top-down and bottom-up approaches to synthesize various types of nanomate	2	2	2	-	-	-	-	-	2	-	-	2				
			CO4	categorize nanomaterials and understand their structure and properties using data fror	3	2	-	-	-	-	-	-	1	-	-	2				
			CO5	demonstrate the knowledge of properties of nanomaterials and their application in curr	3	-	-	-	-	-	-	-	3	-	-	2				
6 - OE	70125641	Six sigma	CO1	To gain an understanding and appreciation of different dimensions of quality and quality tools.			3	2	3	3			1		3	3				
			CO2	Explain the importance of sigma level and demonstrate the ability to apply some mathematical forecasting techniques	2		1	3	2	3						3				
			CO3	Explain the importance of quality control and apply techniques to measure quality control	1		3	3	3	3	3		3	3	3	3				
6 - OE	70125642	Fundamentals of Automotive Technology	CO1	Realize the need and importance of study of automobile engineering for mechanical engineers.	3											2				
			CO2	Identify and compare the relative merits, demerits and applications of different systems and components in an Automobile.	3											2				
			CO3	Explain working of IC engines (Gasoline and Diesel) and various parameters related to it.	3											2				
			CO4	Classify and Illustrate various elements of Automobile like, Transmission, Brakes, Suspension, and Steering etc.	3											2				

		Technology	CO5	Explain recent advancements in field of Automobile engineering, like, Hybrid Vehicles, CRDI engines, ABS etc.	3											2				
			CO6	Explain and illustrate various safety regulations and features along with their importance in automobile engineering.	3					3						2				
6 - OE	70125643	Introduction to Operations Research	CO1	Formulate complex mathematical models from the verbal description of the real system in management science and industrial engineering using correct decision variables.	3	3	3	2	3	-	-	-	-	-	-	-	1	-	2	1
			CO2	Identify and apply the mathematical tools from algebra and calculus for the solution methods for linear programming, transportation and assignment models. Also use mathematical software to solve the proposed models.	3	3	3	-	3	-	-	-	-	-	-	-	2	-	2	1
			CO3	Understand and apply the concept of game theory to practical situations.	1	2	-	1	2	-	-	-	-	-	-	-	2	-	2	1
			CO4	Develop proficiency with tools from probability, statistics and simulation, and apply them to the queuing situations in the service industry to minimize the customers / clients waiting period for service delivery.	2	3	3	-	3	-	-	-	-	-	-	-	2	-	2	1
			CO5	Evaluate and review the network, determine the critical path and estimate the cost of the project.	-	3	3	-	3	-	-	-	2	-	3	-	1	-	2	1
6 - OE	70125644	Smart Materials	CO1	Describe the importance of smart materials on the basis of their applications.	-	-	-	-	-	2	1	-	-	-	-	2				
			CO2	Understand the structure, electrical and magnetic properties of materials.	3	3	-	-	-	-	-	-	1	-	-	2				
			CO3	Classify the smart materials in terms of their unique electric and magnetic properties.	3	3	-	-	-	-	-	-	1	-	-	2				
			CO4	Identify some special smart materials.	-	-	2	-	-	2	-	-	3	-	-	1				
			CO5	Understand some important application of smart materials	-	-	-	-	-	2	-	-	2	-	-	2				
6 - OE	70125646	Introduction to Optimisation	CO1	Understand the importance of optimization techniques in engineering.																
			CO2	Apply basic concept of mathematics to formulate the optimization problems.	3	2	3	3	3	-	-	-	-	-	-	-	2	-	-	2
			CO3	Select and apply appropriate classical optimization methods for one-dimensional and multi-dimensional problems.	3	2	3	3	3	-	-	-	-	-	-	-	2	-	-	2
			CO4	Construct and solve constraint optimization problems.	3	2	3	3	3	-	-	-	-	-	-	-	2	-	-	2
			CO5	Understand the concepts of nature inspired optimization techniques.	3	2	3	3	3	-	-	-	-	-	-	-	2	-	-	2
7	70125701	B.Tech Project	CO1	Design/ develop methodologyby application of core engineering fundamentals aided by modern engineering tools/ software	3	3	3	2	2		1		2	2		3				
			CO2	Prepare execution plan and schedule the activities and distribute responsibilities among the members									3		3	3				
			CO3	Work in a team and carry out the project activities like design/ analysis/ manufacturing as required for the project	3		3		2				2	2	2	3				
			CO4	Validate the project by performing testing. Prepare project report and present the project before panel members					1				2	3	1	3				
7	70125702	Refrigeration and Airconditioning	CO1	To understand the meaning of refrigeration andair refrigeration cycles application in aircraft refrigeration system.	2	1	1	-	-	-	-	-	-	-	-	-	2		3	
			CO2	To understand about how to analysis vapour compression refrigeration cycle using p-h and T-s diagrams.	2	1	1	-	-	-	-	-	-	-	-	-	2		3	
			CO3	To understand how to analyze the vapour Absorption refrigeration system	2	2	-	1	2	-	-	-	-	-	-	1	2		3	
			CO4	Understand properties and applications of refrigerants and their effect on environment.	2	1	-	-	-	2	2	-	-	-	-	2	2		3	
			CO5	Use of psychometric properties for analyzing air-conditioning systems.	2	2	-	-	-	-	-	-	-	-	-	1	2		3	
7	70125705	Refrigeration & Airconditioning Lab	CO1	Student can understand the functioning of various components of refrigeration and air conditioning systems.	2	1	-	-	-	-	-	-	-	-	-	-				
			CO2	Student can understandthe role of refrigerants in cooling applications as well as their impact on the environment	2	1	-	-	-	-	-	-	-	-	-	-				
			CO3	Student can recognize the engineering requirements and efficiency of ice plants	2	2	-	-	-	-	-	-	-	-	-	1	1		2	
			CO4	Understandthe differences between refrigeration and air conditioning. .	2	1	-	-	-	-	-	-	-	-	-	1	1		2	2
			CO5	ToDiagnose faulty refrigeration and air conditioning systems symptomatically.	2	2	-	-	-	-	-	-	-	-	-	1				2
			CO6	ToComprehend the operation of cold storage plants and commercial air conditioning.	2	1	-	-	-	-	-		-	-	-	-	2		2	2
			CO7	Student can understand how to analyse refrigeration and air-condition problems numerically by using modern software	3	3	2	2	2	-	-					2			2	2
7 - Automobile Engineering	70125708	Automotive Safety	CO1	Recall and examine the types, components and functions of car and bus body parts.	3		1									1	2		2	2
			CO2	Recall and analyze different types of forces acting on automotive bodies under static and	2											1	2		2	2
			CO3	Show details of vehicle aerodynamics and wind tunnel technology using basic fluid mechanics.	3				1				1			1			3	
			CO4	Discuss the importance, classification and different types of active and passive safety System.	3	2				3	1					2			3	
			CO5	Experiment with vehicle structural crashworthiness and crash testing.	2	2	1			3			1							
			CO6	Find the importance of ergonomics in automotive safety and human response to impact.	3					3						3				
			CO7	Underline the importance of automotive lighting systems.	3					3						2				
7 - CAD/CAM	70125709	Structural Non Linear and 3D Analysis Lab	CO1	Design and analyze 3D problem using commercial software	3	3	3	2	3	-	-	-	-	-	-	-	-	-	-	-
			CO2	Analyze different types of non-linearities	3	3	3	2	3	-	-	-	-	-	-	-	-	-	-	-
			CO3	Analyze problems using geometric nonlinearities.	3	3	3	2	3	-	-	-	-	-	-	-	-	-	-	-
			CO4	Analyze problems using material nonlinearities.	3	3	3	2	3	-	-	-	-	-	-	-	-	-	-	-
			CO5	Analyze problems using contact nonlinearities.	3	3	3	2	3	-	-	-	-	-	-	-	-	-	-	-
			CO6	Design and analyze the machine component for Non-linear analysis	3	3	3									2				
7	70125710	Automobile Engineering	CO 1	Realize the need and importance of study of automobile engineering for mechanical engineers.Identify and compare the relative merits, demerits and applications of different systems and components in an Automob	3											2			2	
			CO 2	Discuss the construction and working of different types clutch including their limitations	3											2			2	
			CO 3	Compare different types of gear box, working of automatic gear box and discuss the construction and working of different transmission layouts.	3	2										2			2	
			CO 4	Compare the construction and working of different suspension systems. Discuss the concept of dependent and independent suspension systems.	3	3										2			2	

			CO 5	Compare the construction and working of different types braking system, applicability of braking system to cater to need of specific condition including their limitations.	3	3										2			2	
			CO 6	Understand and discuss steering system and the concept of power steering.	3	1										2				
			CO7	Understand and explain electricalsystems and subsystems																
7	70125711	Mechanical Vibration	CO 1	Understand the importance of vibrations in mechanical system design.	2	3	2	-	-	-	-	-	-	-	-	-	-	1	2	-
			CO 2	Generate the linear vibratory model for a dynamic system.	2	2	3	-	-	-	-	-	-	-	-	-	-	1	2	-
			CO 3	Generate the linear mathematical models for different engineering systems.	2	3	2	-	-	-	-	-	-	-	-	-	-	1	2	-
			CO 4	Determine the vibratory responses for single and multi degrees of freedom systems.	2	2	3	-	-	-	-	-	-	-	-	-	-	1	2	-
			CO 5	Analyze the free and forced vibration system of single and multi degrees of freedom linear systems.	2	2	2	-	-	-	-	-	-	-	-	-	-	1	2	-
			CO 6	Generate equation of motion for different vibrating bodies.	2	3	3	-	-	-	-	-	-	-	-	-	-	1	2	-
7	70125712	Tool Engineering	CO1	Acquire knowledge on cutting tool materials, tool geometry, mechanics of machining.	3	2														
			CO2	Apply their knowledge in usage of sheet metal in manufacturing process.	3	2														
			CO3	Design appropriate mould for different manufacturing operations.	3	2														
7	70125713	Total Quality Management	CO1	To gain an understanding and appreciation of different dimensions of quality and quality tools.	1	2	1	-												
			CO2	Description of the various philosophies of evolution of quality.	2	2	-	-												
			CO3	Explain the importance of quality control and apply statistical techniques to measure quality control.	1	2	1	1												
			CO4	To apply various quality improvement techniques and to understand quality management system.	1	1	1	1												
7	70125714	Nature Inspired Optimization Techniques	CO1	Understand the use of modern optimization techniques.	3	3	3	3	3				1		3					
			CO2	Apply Genetic Algorithm and Simulated Annealing to various engineering problems.	3	3	3	3	3				1		3					
			CO3	Understand and apply the algorithm of Particle Swarm Optimization and Ant Colony Optimization to various engineering problems.	3	3	3	3	3				1		3					
			CO4	Understand and apply Cohort Intelligence approach to various engineering problems.	3	3	3	3	3				1		3					
7	70125715	Non Conventional Energy Sources	CO1	Identify the empirical and experimental modes of estimating the solar radiation availability on a horizontal and tilted location.	3				2		1				1					
			CO2	Describe solar photovoltaic systems and solar thermal power plant	3	2			2		1				1					
			CO3	Study geothermal energy, ocean thermal energy, tidal energy and fuel cells as alternative sources of energy.	3				2		1						2			
			CO4	Define and discuss biomass, energy generation from biomass, biogas and biogas plants.	2	2			2		1				1					
8	70125801	Internship	CO1	Understand company organisational structure, products, services, processes, departments, customers, vendors etc.	3												1			
			CO2	Apply theoretical knowledge and concepts (as acquired under mechanical engineering program courses) to solve assignments given by company mentor (in mutual agreement with college mentor)	3				1											
			CO3	Identify, formulate and analyse existing engineering problems in industry (as assigned by company) related to design, manufacturing, procurement, quality, maintenance, research, new product development etc.		2	1	1												
			CO4	Suggest solutions to assigned engineering problems considering health, safety, legal and environmental standards/requirements.			2			2	2							1	3	
			CO5	Understand and demonstrate effective verbal/written communication, listening and documentation skills.										3						
			CO6	Demonstrate individual responsibility, participation in teams and management of multiple assignments/projects									2		2		1			
			CO7	Develop and demonstrate professional work habits, attitudes, ethics and behaviour								1	2			1				
8	70125802	Seminar	CO1	Select a broad area of study related to the company of internship and its products / processes	3															
			CO2	Identify and critically study relevant, quality and latest published research literature on the topic		3			3											
			CO3	Summarize and analyze the selected literature for primary contributions, methodology and shortfalls		3		1			1									
			CO4	Identify newer possible directions of research in the selected area		2		1			1									
			CO5	Correlate research focus with current scenario in industry as evident during internship		2		2			1									
			CO6	Document and communicate/present the study effectively as per institute requirements								2		3						