



Shiksha Mandal's
Bajaj Institute of Technology, Wardha

Mapping of COs with POs and PSOs (Department of Mechanical Engineering)

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Machine Drawing & CAD (BTMEC304) (Theory)	1 Interpret the object with the help of given sectional and orthographic views.	2								3	2		1	2	1
	2 Construct the curve of intersection of two solids	2	1							2	1		1	2	1
	3 Draw machine element using keys, cotter, knuckle, bolted and welded joint	2								2	1			2	1
	4 Assemble details of any given part. i. e. valve, pump, machine tool part etc.	2	2			1				2	1		1	2	1
	5 Represent tolerances and level of surface finish on production drawings	1	1			1				2	1		1	3	1
	6 Understand various creating and editing commands in Auto CAD	1	1			1				2	2		1	2	1

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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Machine Drawing & CAD Lab (BTMEL309)	1 Draw Conventional representation of standard machine components, welds, materials etc.	2								3	2		1	2	1
	2 Draw sectional view of a given machine component.	2	1							2	1		1	2	1
	3 Develop Assemble view from details of given component i.e. valve, pump, machine tool part, etc.	2	2							2	1			2	1
	4 Combine details of given machine component and draw assembled view.	2				1				2	1		1	2	1
	5 Use various Auto-Cad commands to draw orthographic projection	1	1			1				2	1		1	3	1
	6 Draw sectional view from pictorial view of given machine component using Auto-Cad	1	1			1				2	2		1	2	



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Materials Science & Metallurgy Lab (BTMEL307)	1 Understand mechanical properties of materials and calculations of same using appropriate equations	3	2	2	3	2								2	2
	2 Evaluate phase diagrams of various materials	2	1	2	1	1								2	2
	3 Suggest appropriate heat treatment process for a given application	1	2	2	1	2	1	2	1	1	1			2	2
	4 Prepare samples of different materials for metallography	1	1	1	3	2		1		1				2	2
	5 Recommend appropriate NDT technique for a given application	1	1	2	2	2	1	2		1	1			2	2
Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Fluid Mechanics Lab (BTMEL308)	1 Understand laminar and Turbulent flow and determine Critical Reynolds number using Reynolds Apparatus	1	1	1	3	1				1	2		1	1	2
	2 Verify Bernoulli's theorem	1	1	1	3	1				1	2		1	1	2
	3 Determine pressure drop in flow through pipes and pipe fittings	1	1	1	3	1				1	2		1	2	2
	4 Verify momentum equation using impact of jet apparatus	1	1	1	3	1				1	2		1	1	2
	5 Determine viscosity using viscometer	1	1	1	3	1				1	2		1	1	2
	6 Do calibration of pressure gauges, rotameter	1	1	1	3	1				1	2		1	2	2
	7 Use manometers for pressure measurement	1	1	1	3	1				1	2		1	1	2



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Fluid Mechanics (BTMEC303)	1 Define fluid, define and calculate various properties of fluid	3	3	2	2	1							1	1	1
	2 Calculate hydrostatic forces on the plane and curved surfaces and explain stability of floating bodies	3	3	1	1	1							1	1	1
	3 Explain various types of flow. Calculate acceleration of fluid particles	3	3	1	1	1							1	2	1
	4 Apply Bernoulli's equation to simple problems in fluid mechanics	3	3										1	2	1
	5 Explain laminar and turbulent flows on flat plates and through pipes	3	3										1	2	1
	6 Explain and use dimensional analysis to simple problems in fluid mechanics	2	3										1	2	1
	7 Understand boundary layer, drag and lift	2	3										1	2	1
Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Thermodynamics (BTMEC305)	1 Define the terms like system, boundary, properties, equilibrium, work, heat, ideal gas, entropy etc. used in thermodynamics.	1	1											1	1
	2 Study different laws of thermodynamics and apply these to simple thermal systems like balloon, piston-cylinder arrangement, compressor, pump, refrigerator, heat exchanger, etc. to study energy balance.	1	2	1										1	1
	3 Study various types of processes like isothermal, adiabatic, etc. considering system with ideal gas and represent them on p-v and T-s planes.		1	1										1	1
	4 Apply availability concept to non-flow and steady flow type systems	2				1								2	2
	5 .Represent phase diagram of pure substance (steam) on different thermodynamic planes like p-v, T-s, h-s, etc. Show various constant property lines on them.	1	1											2	2



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Field Training/ Internship/ Industrial Training-I (BTMEF310)	1 To make the students aware of industrial culture and organizational setup		1	1		2		1			3	3		3	3
	2 To create awareness about technical report writing among the student.		1	1		2		1			3	2		2	2

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Engineering Mathematics-III (BTBS301)	1 Understand the concept of Laplace transform and inverse Laplace transform of elementary functions and apply it to solve the linear differential equations with constant coefficients having their applications in mechanical, electrical, chemical, communication etc. systems.	3	2	1										2	
	2 Apply the concept of Fourier transform to solve the boundary value problems, problems in signal processing and communication system.	3	2	1										1	
	3 Apply partial differential equations to solve heat equation, wave equation and Laplace equation etc.	2	2											2	
	4 Analyze conformal mapping, transformation and perform contour integration of complex function in the study of electromagnetics and signal processing.	1												1	



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Course/Subject with course code	Course Outcomes (COs)	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Fluid Mechanics (BTMC302)	1 Define fluid, define and calculate various properties of fluid	3	3	2	2	1							1	1	1
	2 Calculate hydrostatic forces on the plane and curved surfaces and explain stability of floating bodies	3	3	1	1	1							1	1	1
	3 Explain various types of flow. Calculate acceleration of fluid particles	3	3	1	1	1							1	2	1
	4 Apply Bernoulli's equation to simple problems in fluid mechanics	3	3										1	2	1
	5 Explain laminar and turbulent flows on flat plates and through pipes	3	3										1	2	1
	6 Explain and use dimensional analysis to simple problems in fluid mechanics	2	3										1	2	1
	7 Understand centrifugal pump.	2	3										1	2	1

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Course/Subject with course code	Course Outcomes (COs)	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Thermodynamics (BTMC303)	1 Define the terms like system, boundary, properties, equilibrium, work, heat, ideal gas, entropy etc. used in thermodynamics.	1	1											1	1
	2 Studied different laws of thermodynamics and apply these to simple thermal systems to study energy balance.	1	2	1										1	1
	3 Studied Entropy, application and disorder		1	1										1	1
	4 Studied various types of processes like isothermal, adiabatic, etc. considering system with ideal gas and represent them on p-v and T-s planes.	2												2	2
	5 Represent phase diagram of pure substance (steam) on different thermodynamic planes like p-v, T-s, h-s, etc. Show various constant property lines on them.	1	1											2	2



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Mechanical Engineering Lab-I (BTMCL306)	1 Define fluid, define and calculate various properties of fluid	3	3	2	2	1									1	1
	2 Apply Bernoulli's equation to simple problems in fluid mechanics	3	3												2	1
	3 Explain laminar and turbulent flows on flat plates and through pipes	2	3												2	1
	4 Understand centrifugal pump.	2	3												2	1
	5 Understand mechanical properties of materials and calculations of same using appropriate equations	3	2	2	3	2									2	2
	6 Evaluate phase diagrams of various materials	2	1	2	1	1									2	2
	7 Suggest appropriate heat treatment process for a given application	1	2	2	1	2	1	2	1	1	1				2	2
	8 Prepare samples of different materials for metallography	1	1	1	3	2		1		1					2	2

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		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
IT-1 Evaluation (BTES209P)	1 To make the students aware of industrial culture and organizational setup		1	1			2		1				3	3	3	2
	2 To create awareness about technical report writing among the student.		1	1			2		1				3	2	2	2

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Product Design Engineering-I (BTID405)	1 Create simple mechanical designs	2		1		2							2		2	2
	2 Create design documents for knowledge sharing					2				1			2		2	2
	3 Manage own work to meet design requirements	2		2	2	2							3		1	2
	4 Work effectively with colleagues									2			2		3	1



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Physics of Engineering Materials (BTBSE406A)	1 Understand the different types of structures of solid, defects in solids and analysis of crystal structure by X-ray diffraction technique.	3	2			3		1					3	1	2
	2 Understand the origin and types of magnetism, significance of hysteresis loop in different magnetic materials and their uses in modern technology	3	3			1		2		2		1	2	1	2
	3 Understand the band structure of solids and conductivity, categorization of solids on the basis of band structure, significance of Fermi-Dirac probability functions	2	2			1		1					3	1	2
	4 Understand the principles of superconductivity, their uses in modern technology	3	3			1		3		1		1	2	1	2
	5 Understand the position of Fermi level in intrinsic and extrinsic semiconductors, Semiconductor conductivity	3	2		2	1		1					1	1	2
	6 Understand the electric field in dielectric	3	2			2		2		3		1	2	1	2
	7 Understand basics of Nano materials, synthesis methods and characterization techniques	2	3	1		3	1	3	1				1	1	2

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Advanced Engineering Chemistry (BTBSE3405A)	1 Classify and explain various types of Corrosion and should apply methods to minimize the rate of corrosion.	2		2		1		2				1	1	1	2
	2 Understand and apply the concepts of Photochemical and Thermal reactions.	2	2	1				2		1		1	1	1	2
	3 Understand the basic concepts of Polymers, Polymerization and Moulding techniques; Determine molecular weight of High-Polymers.	2	2	2		3	1	1		1		1	1	1	2
	4 Understand and apply the basic techniques in Chemistry and capable to explain the concepts of Solvent Extraction.	3	2	1		3				2		1	1	1	2
	5 Understand and apply various types of Spectroscopic, Chromatographic techniques and also able to explain the concepts of Thermo-Gravimetric Analysis (TGA).	3	2	1		3				2		1	1	1	2



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Interpersonal Communication Skill & Self Development (BTHM3402)	1 Acquire interpersonal communication skills								1						2	1
	2 Develop the ability to work independently.										2				2	1
	3 Develop the qualities like self-discipline, self-criticism and self-management.												2		2	1
	4 Have the qualities of time management and discipline.									1					2	1
	5 Present themselves as an inspiration for others										2				2	1
	6 Develop themselves as good team leaders												3		2	1

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Theory of Machines Lab-I (BTMEL408)	1 Perform graphically kinematic analysis of any planar mechanism using ICR and RV methods.	1	1		2								3			2
	2 Perform graphically kinematic analysis of slider crank mechanism using Klein's construction.	1	1		3								3			2
	3 Demonstrate use of graphical differentiation method for kinematic analysis of slider crank mechanism or any other planar mechanism with a slider.	1	1		2								2	1		3
	4 Sketch polar diagram for a Hooke's joint.	1	1		2								2	2		3



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Manufacturing Processes Lab-I (BTMEL407)	1 Perform plain turning, step turning, knurling, eccentric turning, chamfering and facing operations on lathe.	1	1		3	1		1		1	2		1	1	1
	2 Prepare setup and fabricate composite job using milling, shaping and drilling machine.	1	1		3	1		1		1	2		1		1
	3 Making spur gears on a milling machine.	1	1		3	1		1		1	2		1	1	
	4 Prepare sand casting setup using split pattern for simple component.	2	1		3	1		1		1	2		1	1	
	5 Perform joining of two plate using TIG/MIG welding.	2	1		3	1		1		1	2		1		1
	6 Demonstrate cutting of a sheet metal using flame cutting.	1	1		3	1		1		1	1		1		

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Strength of Materials Lab (BTMEL409)	1 State the basic definitions of fundamental terms such as axial load, eccentric load, stress, strain, E, μ , etc.	1	1		1				1				2	3	1
	2 Recognize the stress state (tension, compression, bending, shear, etc.) and calculate the value of stress developed in the component in axial/eccentric static and impact load cases.	1	1	2	2								2	3	1
	3 Distinguish between uniaxial and multiaxial stress situation and calculate principal stresses, max. shear stress, their planes and max. normal and shear stresses on a given plane.	1	1	2	2		1						3	3	1
	4 Calculate slope and deflection at a point on cantilever /simply supported beam using double integration, Macaulay's , Area-moment and superposition methods	1	1	2	3								2	3	2



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Numerical Methods Lab (BTMEL410)	1 Develop the computer programming based on the Numerical Techniques	3	3		1	3								2	2
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Manufacturing Processes-I (BTMC401)	1 Identify castings processes, working principles and applications and list various defects in metal casting	1	1	1		1	1				1		1		1
	2 Understand the various metal forming processes, working principles and applications	2	2	1		1	1				1		1	2	1
	3 Classify the basic joining processes and demonstrate principles of welding, brazing and soldering.	2	1	1		1	1				1		1	2	2
	4 Study center lathe and its operations including plain, taper turning, work holding devices and cutting tool.	1		1		1	1				1		1	1	
	5 Understand milling machines and operations, cutters and indexing for gear cutting.	2		1		1	1				1		1	2	2
	6 Study shaping, planing and drilling, their types and related tooling's	1				1	1				1		1	1	2



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Theory of Machines-I (BTMC 402)	1 Define basic terminology of kinematics of mechanisms				1								3		
	2 Classify planar mechanisms and calculate its degree of freedom				1								3	2	
	3 Perform kinematic analysis of a given mechanism using ICR and RV methods	1	1		2								3	2	3
	4 Introduction of different types of lubrication system.	1												2	3
	5 Perform kinematic analysis of slider crank mechanism using Klein's construction and analytical approach	1	1		3								2	1	
	6 Perform balancing of unbalance forces in rotating masses, different types of single/multi cylinder reciprocating engines in different positions.	1	1										2	3	3

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Theory of Machines-I (BTMEC 402)	1 Define basic terminology of kinematics of mechanisms				1								3	1	2
	2 Classify planar mechanisms and calculate its degree of freedom				1								3	2	3
	3 Perform kinematic analysis of a given mechanism using ICR and RV methods	1	1		2								3	1	3
	4 Perform kinematic analysis of a given mechanism analytically using vector or complex algebra method	1	1		2								2		1
	5 Perform kinematic analysis of slider crank mechanism using Klein's construction and analytical approach	1	1		3								2		



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Basic Human Rights (BTHM403)	1	Understand the history of human rights							2								
	2	Learn to respect others caste, religion, region and culture															
	3	Be aware of their rights as Indian citizen															
	4	Understand the importance of groups and communities in the society										3					
	5	Realize the philosophical and cultural basis and historical perspectives of human rights								2			2				
	6	Make them aware of their responsibilities towards the nation														1	1

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Strength of Materials (BTMES404)	1	State the basic definitions of fundamental terms such as axial load, eccentric load, stress, strain, E, μ , principal stresses, etc.	1	1		1				1				2	3	1
	2	Analyze the stresses and strain energy in different load cases.	1	1	2	2							2	3	3	1
	3	Design the columns based on deflection.	1	1	2	2		1					3	3	3	1
	4	Design a beam based on bending and shafts based on torsion.	1	3	2	1							2	3	3	2
	5	Analyze given beam for calculations of SF and BM.	1	1	2	3							2	3	3	2
	6	Calculate slope and deflection at a point on cantilever/ simply supported beam using double integration, Macaulay's, Area-moment and superposition methods.	1	2	2	2							2	3	3	2



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Ele-I: Sheet Metal Engineering (BTMPE405B)	1 Recognize common manufacturing processes of Sheet Metal Fabrication	1	1	1	3	2				2	1		1	2	1
	2 Understand the principles of design and fabricate of sheet metal products and recognize common material used in the industry	3			1	3	2	3					2	2	1
	3 Distinguish Shearing, Drawing and Pressing etc. processes.	1	1		3	3	2	1		3		1	3	2	2
	4 Know types of dies and formability.	3	3	1	1	3		1	1	1				3	2
	5 Select mechanical or hydraulic presses for the given process	3	2			3	3	2				1	3	3	1
	6 Determine the essential design parameters for Die & Punch	3	2	2	2								2	3	1

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Ele-I: Fluid Machinery (BTMPE405C)	1 Understand and apply momentum equation	3	2	1									1	1	2
	2 Understand and explain Hydrodynamic Machines	3		3				2					1	2	1
	3 Explain difference between impulse and reaction turbines	3	2										1	1	1
	4 Find efficiencies, draw velocity triangles	3	3	2									1	2	3
	5 Explain governing mechanisms for hydraulic turbines			3									1	1	2
	6 Explain working of various types of pumps, draw velocity diagrams, do simple calculations	3	3	3	1	1							1	2	3
	7 Design simple pumping systems	3	3		3								1	3	3



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Mechanical Engineering Lab-II (BTMCL406)	1 Identify castings processes, working principles and applications and list various defects in metal casting	1	1	1		1	1				1	1			1
	2 Understand the various metal forming processes, working principles and applications	2	2	1		1	1				1	1		2	1
	3 Classify the basic joining processes and demonstrate principles of welding, brazing and soldering.	2	1	1		1	1				1	1		2	2
	4 Study center lathe and its operations including plain, taper turning, work holding devices and cutting tool.	1		1		1	1				1	1		1	
	5 Understand milling machines and operations, cutters and indexing for gear cutting.	2		1		1	1				1	1		2	2
	6 Study shaping, planing and drilling, their types and related tooling's	1				1	1				1	1		1	2
	7 Perform kinematic analysis of a given mechanism using ICR and RV methods	1	1		2								3	2	3
	8 Perform kinematic analysis of slider crank mechanism using Klein's construction and analytical approach	1	1		3								2	1	
	9 State the basic definitions of fundamental terms such as axial load, eccentric load, stress, strain, E, μ , principal stresses, etc.	1				1	1			1			1	3	1
	10 Analyze the stresses and strain energy in different load cases.	1				1	1			1			1	3	1
	11 Design a beam based on bending.	1				1	1			1			1	3	1



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Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Field Training/ Industrial Training (BTMI407)	1 To make the students aware of industrial culture and organizational setup		1	1			2		1			3	3	3	2
	2 To create awareness about technical report writing among the student.		1	1			2		1			3	2	2	2

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Product Design Engineering-II (BTID506)	1 Create Prototype	1		1		3				2	1		3	3	2
	2 Test Prototype		1										2	2	2
	3 Understand Product Life Cycle	1			1								2	2	

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
Heat Transfer Lab (BTMEL507)	1 Understand the various heat transfer mode of heat transfer and its application and verify	2	3		3	2									1	2
	2 Learn the experimental methodology	3	3		3	2		2							2	2
	3 Describe the concept the terms like least count, calibration of the instruments	3	3		3	2		2							1	2

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
Applied Thermodynamics Lab (BTMEL508)	1 Conduct test on Bomb calorimeter, nozzle, steam turbine, condenser, compressor etc. to study their performance.	1			2										2	2
	2 Draw performance curves of these machines.	2	1		1										2	2
	3 Analyze the results obtained from the tests.	1	2	1	2	1	1								2	2
	4 Draw conclusions based on the results of the experiments				2										2	2
	5 Based on your visit to Industry, sketch its layout and write specifications.		1				1				2		2		3	2



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Machine Design Practice-I (BTMEL509)	1 Apply design process to an open ended problem	1	1	2	2			2	1					2	1
	2 Determine suitable material and size for structural component of machine/system	1	3	2	1			1	1				1	2	1
	3 Apply iterative technique in design including making estimate of unknown values for first computation and checking or revisiting and re-computing	3	2	2	1			1	1				1	2	2
	4 Choose logically and defend selection of design factors	2	2	2	2			1	1				1	2	2
	5 Design of components for given part/system i.e. shaft, keys, coupling, links, screws, springs etc.	3	3	2	1			2	1				1	3	2
	6 Work effectively as a part of design group/team						1	1	1	2	2		2	3	1
	7 Have good communication skill, orally, graphically as well as in writing								1	1	2	2	3	3	1

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Theory of Machines Lab-II (BTMEL510)	1 Explain various types of gear boxes, gear trains, belt and rope drives	2	2	1	2	2		2						1	1
	2 Interpreting physical principles and phenomenon of governor, gyroscopic, flywheel	2	2	1	2	2						3		1	
	3 Measure vibration parameters in single degree of freedom systems	3	3		3	3							3	1	1
	4 Evaluating natural frequency of 1 dof	2	3		3	3							3		1

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Field Training/ Internship/ Industrial Training-II (BTMEF511)	1 To make the students aware of industrial culture and organizational setup		1	1			2		1			3	3	3	2
	2 To create awareness about technical report writing among the student.		1	1			2		1			3	2	2	2



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Heat Transfer (BTMC501)	1 Explain the laws of heat transfer and deduce the general heat conduction equation and to explain it for 1-D steady state heat transfer in regular shape bodies	2	1			1				1				1	2
	2 Describe the critical radius of insulation, overall heat transfer coefficient, thermal conductivity and lumped heat transfer	3	2			1								2	2
	3 Interpret the extended surfaces	3	1			2		2		1				1	2
	4 Illustrate the boundary layer concept, dimensional analysis, forced and free convection under different conditions	3	3		1	1				1				1	2
	5 Describe the Boiling heat transfer, Evaluate the heat exchanger and examine the LMTD and NTU methods applied to engineering problems	3	3	3		1		2						2	1
	6 Explain the thermal radiation black body, emissivity and reflectivity and evaluation of view factor and radiation shields	2	3		2	2		2		1				2	1

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Machine Design-I (BTMC502)	1 Formulate the problem by identifying customer need and convert into design specification	1	1						1				1	2	1
	2 Understand component behavior subjected to loads and identify failure criteria	3	2		1		1		1		1		1	2	2
	3 Analyze the stresses and strain induced in the component	1	1				1		1		1		1	2	1
	4 Design of machine component using theories of failures	3	3	2	1		2		1		1		1	2	1
	5 Design of component for finite life and infinite life when subjected to fluctuating load	1	1				1		1		1		1	2	2
	6 Design of components like shaft, key, coupling, screw and spring	2	2	2	1		1		1		1		1	3	2



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Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
Theory of Machines-II (BTMC503)	1 Identify and select type of belt and rope drive for a particular application	2	3	1		2		1			2		2	2	1	
	2 Evaluate gear tooth geometry and select appropriate gears, gear trains	2	3					1					3	2	2	
	3 Define governor and select/suggest an appropriate governor		2										2	1	1	
	4 Characterize flywheels as per engine requirement		2		1									1	2	
	5 Understand gyroscopic effects in ships, aero planes, and road vehicles.	2	3		2									3	1	2
	6 Understand free and forced vibrations of single degree freedom systems	2	3		3									3	2	3

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Ele-II: Refrigeration & Airconditioning (BTMPE504A)	1 Describe the concept of refrigeration and its units and explain properties of refrigerants	1						2	2					1	1
	2 Describe Vapour compression refrigeration system and how properties affects the COP of the system	3	1	1	2			1						2	2
	3 Explain Vapour Absorption Refrigeration System and its comparison with V.C.R.S	3	1	1	2			1						2	2
	4 Explain various air conditioning systems with air properties using psychometric chart	2	2	2				1						2	2
	5 Estimate load calculations and explain the effect of temperature on human health	3	2	2	1			2						3	3



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2		
Ele-II: Automobile Engineering (BTAPE504D)	1 Identify the different parts of the automobile	2	1														
	2 Explain the working of various parts like engine, transmission, clutch, brakes etc.,	1	2		2		1										
	3 Demonstrate various types of drive systems	1	1		1	1										2	2
	4 Apply vehicle troubleshooting and maintenance procedures	2			3	1										2	2
	5 Analyze the environmental implications of automobile emissions. And suggest suitable regulatory modifications		2			1	1	2								3	3

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2		
Ele-I: Automobile Engineering (BTMEC506A)	1 Identify the different parts of the automobile	2	1														
	2 Explain the working of various parts like engine, transmission, clutch, brakes etc.,	1	2		2		1										
	3 Demonstrate various types of drive systems	1	1		1	1										2	2
	4 Apply vehicle troubleshooting and maintenance procedures	2			3	1										2	2
	5 Analyze the environmental implications of automobile emissions. And suggest suitable regulatory modifications		2			1	1	2								3	3
	6 Evaluate future developments in the automobile technology.	1		2			2									3	3



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
OE-I: Solar Energy (BTMOE505A)	1 Describe measurement of direct, diffuse and global solar radiations falling on horizontal and inclined surfaces.	1													1	2
	2 Analyze the performance of flat plate collector, air heater and concentrating type collector.	1	2				1								2	1
	3 Understand test procedures and apply these while testing different types of collectors.	2			1	1		2							2	2
	4 Study and compare various types of thermal energy storage systems.	1	1												2	1
	5 Analyze payback period and annual solar savings due to replacement of conventional systems.		2			1									3	1
	6 Design solar water heating system for a few domestic and commercial applica			2	3		1	1							3	1

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
OE-I: Renewable Energy Sources (BTMOE505B)	1 Explain the difference between renewable and non-renewable energy	1	2	3		2	3	3	3	2	2		2	1	3
	2 Describe working of solar collectors	1	1	3	1	2	3	3	3	2	2		2	1	3
	3 Explain various applications of solar energy	2	1	1					2	2	1		2	1	3
	4 Describe working of other renewable energies such as wind, biomass , nuclear	3	3			2	3	3	2				1	1	3



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
OE-I: Human Resource Management (BTMOE505C)	1 Describe trends in the labor force composition and how they impact human resource management practice.					2							1	2	1	
	2 Discuss how to strategically plan for the human resources needed to meet organizational goals and objectives.											3		2	1	
	3 Define the process of job analysis and discuss its importance as a foundation for human resource management practice										2			2		
	4 Explain how legislation impacts human resource management practice.							2			2			2		
	5 Compare and contrast methods used for selection and placement of human resources.									2	3			3		
	6 Describe the steps required to develop and evaluate an employee training program											1		3		
	7 Summarize the activities involved in evaluating and managing employee performance.											2		2	3	
	8 Identify and explain the issues involved in establishing compensation systems.													2	3	

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
OE-I: Product Design Engineering (BTMOE505D)	1 Understand the need for product design		1											2	1
	2 Apply various methods of idea generation			1		2								2	2
	3 Understand various types of prototypes and testing methods			2										2	2
	4 Understand the product economics at production scale											1		2	
	5 Appreciate the environmental concerns in product lifecycle												1	1	1



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2		
Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2		
Applied Thermodynamics (BTMC506)	1 Define the terms like calorific value of fuel, stoichiometric air-fuel ratio, excess air, equivalent evaporation, boiler efficiency, etc. Calculate minimum air required for combustion of fuel.	1	1													1	1
	2 Studied and Analyze gas power cycles and vapour power cycles and derive expressions for the performance parameters like thermal efficiency.	1	2													1	1
	3 Classify various types of boilers, nozzle, steam turbine and condenser used in steam power plant.	1														2	2
	4 Classify various types condenser, nozzle and derived equations for its efficiency.			1												1	1
	5 Draw P-v diagram for single-stage reciprocating air compressor, with and without clearance volume, and evaluate its performance. Differentiate between reciprocating and rotary air compressors.		2													1	1



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
Mechanical Engineering Lab-III (BTMCL507)	1	Describe the critical radius of insulation, overall heat transfer coefficient, thermal conductivity and lumped heat transfer	3	2		1		1		1		1		1	1	1
	2	Interpret the extended surfaces	1	1				1		1		1		1	2	2
	3	Explain the thermal radiation black body, emissivity and reflectivity and evaluation of view factor and radiation shields	2	2	2	1		1		1		1		1	1	2
	4	Explain various types of gear boxes, gear trains, belt and rope drives	2	2	1	2	2		2						2	1
	5	Interpreting physical principles and phenomenon of governor, gyroscopic, flywheel	2	2	1	2	2							3	2	1
	6	Measure vibration parameters in single degree of freedom systems	2	3		3	3							3	1	2
	7	Evaluating natural frequency of 1 dof	2	3		3	3							3	1	2
	8	Formulate the problem by identifying customer need and convert into design specification	2	3	1		2		1			2		2	2	1
	9	Understand component behavior subjected to loads and identify failure criteria	2	3					1					3	2	2
	10	Analyze the stresses and strain induced in the component		2										2	1	1
	11	Design of machine component using theories of failures		2		1									1	2
	12	Design of component for finite life and infinite life when subjected to fluctuating load	2	3		2								3	1	2
	13	Design of components like shaft, key, coupling, screw and spring	2	3		3								3	2	3

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
IT-2 Evaluation (BTMI408)	1	To make the students aware of industrial culture and organizational setup		1	1			2		1			3	3	3	2
	2	To create awareness about technical report writing among the student.		1	1			2		1			3	2	2	2



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2		
Applied Thermodynamics-II (BTMEC603)	1	Basic knowledge of Different types of IC Engines, selection criteria of engines as per their application.				1								3		1	1
	2	Understanding of testing methods for I.C. Engines		1		1										1	2
	3	Understanding of properties Refrigerants and working VCC & VAC Cycle.	1	1		2								3		1	2
	4	Understanding Psychometric properties and various air conditioning devices.	1	1		2			3			2				2	3
	5	Understanding of Non-conventional Power Plant Operation, their working and power generating capacity.	1	1										3		1	2
Additive Manufacturing (BTMEC604C)	1	Understand the importance of Additive Manufacturing	3	3	2	2	2	2					1		1	1	1
	2	Classify the different AM processes	2	2	3	3	3	3	1					1		2	1
	3	Design for AM processes	2	2	3	3	3		2					1		1	1
	4	Understand the applications of AM	3	3	3	2	2	2	2					1			1
	5	Differentiate the post processing processes	2	3	3	2	2	2	2					1		3	1
Biology for Engineers (BTMEC606A)	1	Explain origin of life and Evolution, Cells, Biomolecules-Lipids	1	2	3		1		1			1		1		1	2
	2	Understand Biomolecules	1	2	3		1		1			1		1		1	2
	3	Understand Cell structure and function and cell cycle	1	2	3		1		1			1		1		1	2
	4	Explain Mendelian genetics	1	2	3		1		1			1		1		1	2
	5	Understand and Explain DNA structure, DNA replication, Transcription, Translation	1	2	3		1		1			1		1		1	2



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Mechanical Measurements (BTMEC604D)	1 Define measurement parameters, and Identify errors in measurement		1	3	3	1							2	1	2
	2 Identify methods and devices for measurement of length, angle	1	2	2	1	1							2	1	2
	3 Identify methods and devices for measurement of pressure, flow, force, torque, strain, velocity, displacement, acceleration, temperature	1	1	3	2	1							1	2	2

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Sustainable Development (BTMEC605B)	1 Explain the difference between development and sustainable development	1	2	3		2	3	3	3	2	2		2	2	1
	2 Explain challenges of sustainable development and climate change	1	1	3	1	2	3	3	3	2	2		2	2	1
	3 Explain sustainable development indicators	2	1	1				3	2		1		2	2	1
	4 Analyze sustainable energy options	3	3			2	3	3	2				1	2	1
	5 Understand social and economic aspects of sustainable development			3			2	3	2				1	2	1

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Metrology & Quality Control Lab (BTMEL607)	1 Measure linear, angular circular features, dimensional and geometric features	1	1	1	3	1							2	3	2
	2 Measure surface roughness of components			2	2		1		1				2	2	2
	3 Calibration of metrological equipment			3	2		1						2	2	2



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Technical Project for Community Services (BTMEM611)	1 Visit nearby places to understand the problems of the community						2	1	1		2		1	2	2
	2 Select one of the problems for the study, state the exact title of the project and define scope of the problem		2								2	1		2	2
	3 Explain the motivation, objectives and scope of the project						1				2	1		2	2
	4 Evaluate possible solutions of the problem		1	2				1	2					3	2
	5 Design, produce, test and analyze the performance of product/system/process	1	1	2	3	1	1	1	2	1	1	1		3	2
	6 Modify, improve the product/system/process			2	1	1		1	1					3	2

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Manufacturing Processes-II (BTMC601)	1 Understand the process of powder metallurgy and its applications	3	3	1	1			2					1	2	2
	2 Calculate the cutting forces in orthogonal and oblique cutting	3	3										1	2	1
	3 Evaluate the machinability of materials	3	3	1	2	3							1	1	2
	4 Understand the abrasive processes	3	3	2									1	1	2
	5 Explain the different precision machining processes	3	3	1	3								1	2	1
	6 Understanding plastic	3	1	3	3	3			2				1	1	2



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Mapping of COs with POs and PSOs (Department of Mechanical Engineering)

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Machine Design-II (BTMC602)	1	Define function of bearing and classify bearings.	1	1					1				1	3	1
	2	Understanding failure of bearing and their influence on its selection	3	2		1		1		1	1		1	3	1
	3	Classify the friction clutches and brakes and decide the torque capacity and friction disk parameter	1	1				1		1	1		1	2	1
	4	Select materials and configuration for machine element like gears, belts and chain	3	3	2	1		2		1	1		1	2	2
	5	Design of elements like gears, belts and chain for given power rating	1	1				1		1	1		1	2	2

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Machine Design-II (BTMEC602)	1	Define function of bearing and classify bearings.	1	1					1				1	3	1
	2	Understanding failure of bearing and their influence on its selection	3	2		1		1		1		1	1	3	1
	3	Classify the friction clutches and brakes and decide the torque capacity and friction disk parameter	1	1				1		1		1	1	2	1
	4	Select materials and configuration for machine element like gears, belts and chain	3	3	2	1		2		1		1	1	2	2
	5	Design of elements like gears, belts and chain for given power rating	1	1				1		1		1	1	2	2
	6	Design thickness of pressure vessel using thick and thin criteria	3	2	2	1		1		1		1	1	2	1



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Ele-III: IC Engines (BTMPE603A)	1 Understand various types of I.C. Engines and Cycles of operation	3						3						1	1
	2 Analyze the effect of various operating variables on engine performance		2											2	1
	3 Identify fuel metering and fuel supply systems for different types of engines	2												1	1
	4 Understand normal and abnormal combustion phenomena in SI and CI engines	2												2	2
	5 Evaluate performance Analysis of IC Engine and Justify the suitability of IC Engine for different application					2		3						2	1
	6 Understand the conventional and non-conventional fuels for IC engines and effects of emission formation of IC engines, its effects and the legislation standards	2												2	1

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Ele-III: Mechanical Vibrations (BTMPE603B)	1 Understand the cause and effect of vibration in mechanical system	2	2	1	1	2	1	1					2	2	
	2 Formulate governing equation of motion for physical system	3	3	2	1	1							2	1	3
	3 Understand role of damping, stiffness and inertia in mechanical system	3	2	2	1	1							2	3	2
	4 Analyze rotating system and calculate critical speeds	3	3	2	2	2							2	3	2
	5 Estimate the parameters of vibration isolation system	3	3	2	2	2		3					2	3	2
	6 Estimate natural frequencies and mode shapes of continuous system	3	3	3	2								2	2	3



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Ele-III: Machine Tool Design (BTMPE603C)	1 Understand basic motion involved in a machine tool	2	1	2	1	1	1				1	1	1	2	2	
	2 Design machine tool structures for conventional and CNC machines.	3	1	3	1	2	1	1		1	1	1	1	3	2	
	3 Design and analyze system for specified speeds and feeds.	2	1	2	1	1	1			1	1	1	1	3	2	
	4 Understand control strategies for machine tool operations.	2	1	1	1	1	1	1			1	1	1	2	3	
	5 Design of rotary and linear drive for machine tools.	3	1	3	1	1	1	1			1	1	1	1	3	2
	6 Analyze machine tool structure for design accuracy.	2	1	2	1	1	1	1			1	1	1	1	3	2

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		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
Ele-III: Engineering Metrology & Quality Control (BTMPE603D)	1 Identify techniques to minimize the errors in measurement.				3								2	3	1	
	2 Identify methods and devices for measurement of length, angle, and gear and thread parameters, surface roughness and geometric features of parts.		2	2		2								2	2	
	3 Choose limits for plug and ring gauges.			2	3	2								2	1	
	4 Explain methods of measurement in modern machineries.						3							2	2	
	5 Select quality control techniques and its applications.	1					2		3	3			3	2	2	1
	6 Plot quality control charts and suggest measures to improve the quality of product and reduce cost using Statistical tools.	1					2		3	3			2	2	2	2



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Course/Subject with course code	Course Outcomes (COs)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
Ele-III: Advance Automobile Design (BTAPE603C)	1 Understand & apply the automobile design process & manufacturing process		3	2				1					1		3	1
	2 Understand PLM and its application for automotive industry		2			2	1			2		1		3	1	
	3 Apply the CAE tools for design & analysis of automotive components	2				3						1	1	3	2	
	4 Apply the software modelling tools like Catia for modelling of automotive components & structures					3						1		3	2	

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Ele-III: E-Vehicles (BTAPE603E)	1 Understand EV system & parameters						1	1					1	1	2
	2 Select & Design EV Propulsion systems				2			1					1	2	1
	3 Select & choose appropriate battery & battery management system for EV				2	3		1					1	3	1
	4 Design a charging system for EV				2			1					1	2	1

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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Course/Subject with course code	Course Outcomes (COs)	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Ele-IV: Process Equipment Design (BTMPE604A)	1 Understand the factors influencing design of pressure vessel	1		1			1	1	1				1	3	2
	2 Calculate thickness and thickness variation for cylindrical storage tank	2	2	1			1	1	1				1	3	2
	3 Estimation of thickness for thin and thick wall pressure vessels	2	2	2			1	1	1				1	3	2
	4 Design of flange and gasket selection for cylindrical pressure vessels	2	2	2			1	1	1				1	3	2
	5 Selection of various blade and baffle arrangement for agitators	2	2	1			1	1	1				1	3	2
	6 Design of support for horizontal and vertical vessel	2	2	2			1	1	1				1	3	2



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Ele-IV: Product Life Cycle Management (BTMPE604B)	1 Outline the concept of PLM.	1				1						1		3	1
	2 Illustrate the PDM system and its importance.	1				1		1				1		3	1
	3 Illustrate the product design process.	1	1			1								3	1
	4 Build the procedure for new product development.	1	1			1						1		3	1
	5 Classify and compare various technology forecasting methods.	1				1		1						3	1
	6 Outline the stages involved in PLM for a given product.	1				1				1			1	3	1

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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Ele-IV: Finite Element Method (BTMPE604C)	1 Understand the basic principle of Finite element methods and its applications	1	1	1		1				1		1	1	1	3
	2 Use matrix algebra and mathematical techniques in FEA	2	3	2	1	2	1		1			2	1	1	3
	3 Identify mathematical model for solution of common engineering problem	3	2	2	1	1				1		2	1	2	3
	4 Solve structural, thermal problems using Finite Element Method	3	3	2	1	2		1		1		2	1	3	1
	5 Derive the element stiffness matrix using different methods by applying basic mechanics laws	3	1	1		1		1				2	1	2	1
	6 Understand formulation for two and three-dimensional problems	1	1	1						1		1	1	3	1



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Ele-IV: Robotics (BTMPE604D)	1 List the various components of a typical Robot, grippers, sensors, drive system and describe their functions	1	1	1		1				3				2	2
	2 Calculate the world to joint and joint to world coordinates using forward and reverse transformation	2	3	2	1	2	1			3	2			2	2
	3 Calculate the gripper forces, drive sizes, etc.	3	2	2	1	1				3	2			2	2
	4 Develop simple robot program for tasks such as pick and place, arc welding, etc. using some robotic language such as VAL-II, AL, AML, RAIL, RPL, VAL	3	3	2	1	2		1		3	2			2	2
	5 Evaluate the application of robots in applications such as Material Handling, process operations and Assembly and inspection	3	1	1		1		1		3	2			2	2
	6 Discuss the implementation issues and social aspects of robotics	1	1	1						3	2			2	2

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Ele-IV: Computational Fluid Dynamics (BTAPE604B)	1 Identify applications of finite volume and finite element methods to solve Navier-Stoke equations.	1	1	1		1				3	1			1	3
	2 Evaluate solution of aerodynamic flows. Appraise & compare current CFD software. Simplif flow problems and solve them exactly.	2	3	2	1	2	1			3	2			1	3
	3 Design and setup flow problem properly within CFD context, performing solid modeling usin CAD package and producing grids via meshing tool	3	2	2	1	1				3	2			3	1
	4 Interpret both flow physics and mathematical properties of governing Navier-Stokes equation and define proper boundary conditions for solution.	3	3	2	1	2		1		3	2			3	2
	5 Use CFD software to model relevant engineering flow problems. Analyse the CFD results Compare with available data, and discuss the findings	3	1	1		1		1		3	2			3	1



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OE-II: Quantitative Techniques and Project Management (BTMOE605A)	1 Define and formulate research models to solve real life problems for allocating limited resources by linear programming.	2	1	1	3	2				3	1	3	1	2	3
	2 Apply transportation and assignment models to real life situations	3	1	1	3	2				3	2	3	1	2	1
	3 Apply queuing theory for performance evaluation of engineering and management systems.	3	1	1	3	2				3	2	3	1	2	1
	4 Apply the mathematical tool for decision making regarding replacement of items in real life.	3	1	1	3	2	1			3	2	3	1	2	2
	5 Determine the EOQ, ROP and safety stock for different inventory models.	3	1	1	3	2	1			3	2	3	1	3	1
	6 Construct a project network and apply CPM and PERT method.	3	1	1	3	2	2			3	2	3	1	3	2

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OE-II: Nanotechnology (BTMOE605B)	1 Demonstrate the understanding of length scales concepts, nanostructures and nanotechnology.	1	1		3	3	2	1		3		1	3	1	2
	2 To impart basic knowledge on various synthesis and characterization techniques involved in Nanotechnology	3	2			3	3	2			1	3	1	2	
	3 To educate students about the interactions at molecular scale	1	1	1	3	2				2	1		1	1	2
	4 Evaluate and analyze the mechanical properties of bulk nanostructured metals and alloys, Nano-composites and carbon nanotubes.	1	1		3	3	2	1		3		1	3	1	2
	5 To make the students understand about the effects of using nanoparticles over conventional methods	1	1	1	3	2				2	1		1	1	2



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OE-II: Energy Conservation & Management (BTMOE605C)	1 Understand energy problem and need of energy management	1	2	3		2	3			2	2		2	1	1
	2 Carry out energy audit of simple units	1	1	3	1	2	3			2	2		2	2	1
	3 Study various financial appraisal methods	2	1	1							1		2	3	1
	4 Analyze cogeneration and waste heat recovery systems	3	3		2	3							1	2	1
	5 Do simple calculations regarding thermal insulation and electrical energy conservation			3		3									2

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OE-II: Wind Energy (BTMOE605D)	1 Understand historical applications of wind energy							2	2	2	1		1	1	1
	2 Understand and explain wind measurements and wind data		3	2	1	3	2	2	2	2			1	1	1
	3 Determine Wind Turbine Power, Energy and Torque	3	3	1	1	2	2	1					1	2	2
	4 Understand and explain Wind Turbine Connected to the Electrical Network AC and DC	3	3		1								1	1	1
	5 Understand economics of wind energy	3	2	1									1	1	1

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OE-II: Introduction to Probability Theory & Statistics (BTMOE605E)	1 Apply the concepts to find the measure of the central tendency, dispersion and moments for grouped data	1	2	1	2	2	1			1	1		2	2	2
	2 Make use of the correlation, and regression analyses to find the correlation and regression Coefficients	1	1		2	1		1					2	2	2
	3 Observe and analyze the behavior of various discrete and continuous probability Distributions	1	2		2	2	1				2		2	2	2
	4 Investigate the properties such as mathematical expectation and variance of the random Variables.	1	1	1	3	3	1			1			2	2	2



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Mechanical Engineering Lab-IV (BTMCL606)	1 Evaluate the work material effect on chip morphology	3	2	1	3	1	1			1	2		1	2	2	
	2 Estimator the cutting forces in orthogonal cutting	3	2	1	3	1	1			1	2		1	2	1	
	3 Measure tool flank wear in cylindrical turning	3	2		3	1	1			1	2		1	2	2	
	4 Analyze the effect of process parameters on cutting force in milling	3	1	1	3	1	2			1	2		2	1	2	
	5 Determine the MRR AND TWR in Electro-Discharge Machine	1	1	1	2	1	2			1	1		2	2	2	
	6 Demonstrate the wire EDM process	1	1	1	2	1	2			1	2		2	1	1	
	7 Define function of bearing and classify bearings.	1	1		2				1				1	3	1	
	8 Understanding failure of bearing and their influence on its selection	3	2				1		1		1		1	3	1	
	9 Select materials and configuration for machine element like gears, belts and chain	3	3	2	1		2		1		1		1	2	2	
	10 Design of elements like gears, belts and chain for given power rating	1	1		1		1		1		1		1	2	2	
	11 Understand various types of I.C. Engines and Cycles of operation	3							3					1	1	
	12 Analyze the effect of various operating variables on engine performance		2											2	1	
	13 Identify fuel metering and fuel supply systems for different types of engines	2												1	1	
	14 Understand normal and abnormal combustion phenomena in SI and CI engines	2												2	2	
	15 Evaluate performance Analysis of IC Engine and Justify the suitability of IC Engine for different application					2		3						2	1	
	16 Understand the conventional and non-conventional fuels for IC engines and effects of emission formation of IC engines, its effects and the legislation standards	2												2	1	
	17 Measure linear, angular circular features, dimensional and geometric features	1	1	1	3	1								2	3	2
	18 Measure surface roughness of components			2	2		1		1					2	2	2
	19 Calibration of metrological equipment			3	2		1							2	2	2



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B.Tech. Seminar (BTMS607)	1 State the exact title of the seminar	2					2	2	2	2	1		1	1	2
	2 Explain the motivation for selecting the seminar topic and its scope							2		2		1	1	2	
	3 Search pertinent literature and information on the topic	2					1	1	1	3	3		3	1	2
	4 Critically review the literature and information collected	2		1			2	1	2	2	2		2	1	2
	5 Demonstrate effective written and verbal communication										3		1	1	2

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Mini Project (TPCS) (BTMP608)	1 Visit nearby places to understand the problems of the community						2	1	1		2		1	2	2
	2 Select one of the problems for the study, state the exact title of the project and define scope of the problem		2								2	1		2	2
	3 Explain the motivation, objectives and scope of the project						1				2	1		2	2
	4 Evaluate possible solutions of the problem		1	2				1	2					3	2
	5 Design, produce, test and analyze the performance of product/system/process	1	1	2	3	1	1	1	2	1	1	1		3	2
	6 Modify, improve the product/system/process			2	1	1		1	1					3	2

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Field Training/ Industrial Training (BTMI609) (IT-3)	1 To make the students aware of industrial culture and organizational setup		1	1			2		1			3	3	3	2
	2 To create awareness about technical report writing among the student.		1	1			2		1			3	2	2	2



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Mechatronics (BTMEC701)	1 Define sensor, transducer and understand the applications of different sensors and transducers	1	1	1	3	2				2	1		1	3	2
	2 Explain the signal conditioning and data representation techniques	3	2			3	3	2				1	3	2	3
	3 Design pneumatic and hydraulic circuits for a given application	1	1		3	3	2	1		3		1	3	3	3
	4 Write a PLC program using Ladder logic for a given application	3	3	1	1	3		1	1	1				2	3
	5 Understand applications of microprocessor and micro controller	3			1	3	2	3					2	2	3
	6 Analyze PI, PD and PID controllers for a given application		3	3		3	3	1	1	3			2	2	2

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		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CAD/CAM (BTMEC702)	1 List and describe the various input and output devices for a CAD work station	3											1			
	2 Carry out/calculate the 2-D and 3-D transformation positions (Solve problems on 2-D and 3-D transformations)	3	2	1		2							1	3	1	
	3 Describe various CAD modeling techniques with their relative advantages and limitations	1		1										1	2	1
	4 Describe various CAD modeling techniques with their relative advantages and limitations	3												1		
	5 Develop NC part program for the given component, and robotic tasks	1	3	3		1								1	2	3
	6 Describe the basic Finite Element procedure	3	1	1		1								1	3	3
	7 Explain various components of a typical FMS system, Robotics, and CIM	3												1		
	8 Classify parts in part families for GT	3	1	2	3	1								1		
	9 Describe and differentiate the CAPP systems	2	1											1		



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Manufacturing Processes- III (BTMEC703)	1 Differentiate clearly between nc and cnc machines	1	1	1											2	2
	2 Prepare and execute a part program for producing a given product	1	1			1									1	2
	3 Select appropriate non-traditional machining process for a given application	2	2	2											1	1
	4 Compare different surface coating techniques	2	2	1			1	1						1	2	2
	5 Explain different rapid prototyping techniques	1	1	1			1	1							1	2
	6 Illustrate the working principle of various micro-manufacturing processes	1	1	1			1									

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
PEC2: Fluid Machinery (BTMEC704A)	1 Understand and apply momentum equation	3	2	1									1	1	2
	2 Understand and explain Hydrodynamic Machines	3		3				2					1	2	1
	3 Explain difference between impulse and reaction turbines	3	2										1	1	1
	4 Find efficiencies, draw velocity triangles	3	3	2									1	2	3
	5 Explain governing mechanisms for hydraulic turbines			3									1	1	2
	6 Explain working of various types of pumps, draw velocity diagrams, do simple calculations	3	3	3	1	1							1	2	3
	7 Design simple pumping systems	3	3		3								1	3	3



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
Course/Subject with course code	Course Outcomes (COs)	1	2	3	4	5	6	7	8	9	10	11	12	1	2
PEC2: Industrial Engineering & Management (BTMEC704B)	1 Impart fundamental knowledge and skill sets required in the Industrial Management and Engineering profession, which include the ability to apply basic knowledge of mathematics, probability and statistics, and the domain knowledge of Industrial Management and Engineering											2	1	2	2
	2 Produce ability to adopt a system approach to design, develop, implement and innovate integrated systems that include people, materials, information, equipment and energy.									2	2	2		2	2
	3 Understand the interactions between engineering, businesses, technological and environmental spheres in the modern society.								2					2	2
	4 Understand their role as engineers and their impact to society at the national and global context.								2				2	2	2

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Course/Subject with course code	Course Outcomes (COs)	1	2	3	4	5	6	7	8	9	10	11	12	1	2
PEC2: Finite Element Method (BTMEC704C)	1 Understand the basic principle of Finite element methods and its applications	1	1	1		1				1		1	1	1	3
	2 Use matrix algebra and mathematical techniques in FEA	2	3	2	1	2	1		1			2	1	1	3
	3 Identify mathematical model for solution of common engineering problem	3	2	2	1	1				1		2	1	2	3
	4 Solve structural, thermal problems using Finite Element Method	3	3	2	1	2		1		1		2	1	3	1
	5 Derive the element stiffness matrix using different methods by applying basic mechanics laws	3	1	1		1		1				2	1	2	1
	6 Understand formulation for two and three-dimensional problems	1	1	1							1		1	1	3



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Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
PEC2: Surface Engineering (BTMEC704D)	1	Learn the importance and need of surface engineering	2		1							1		1	2	1
	2	Describe various surface cleaning and modification techniques	2				2								2	1
	3	Understand the concepts of surface integrity	2	2	1	2						1			2	1
	4	Compare various surface coating technologies	2				1	1		1		1			2	1
	5	Select appropriate method of coating for a given application	2	2	1		1		1	1	1	1	1		2	1
	6	Apply measurement techniques and carry out characterization of coated surfaces.	2	2	1	2	2			1	1	1			2	1

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
PEC2: Refrigeration & Air Conditioning (BTMEC704E)	1	Describe the concept of refrigeration and its units and explain properties of refrigerants	1						2	2					1	1
	2	Describe Vapour compression refrigeration system and how properties affects the COP of the system	3	1	1	2			1						2	2
	3	Explain Vapour Absorption Refrigeration System and its comparison with V.C.R.S	3	1	1	2			1						2	2
	4	Explain various air conditioning systems with air properties using psychometric chart	2	2	2				1						2	2
	5	Estimate load calculations and explain the effect of temperature on human health	3	2	2	1			2						3	3



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
PEC2: Automobile Design (BTAEC704C)	1 Understand & apply the automobile design process & manufacturing process		3	2				1				1		3	1
	2 Understand PLM and its application for automotive industry		2			2	1			2		1		3	1
	3 Apply the CAE tools for design & analysis of automotive components	2				3						1	1	3	2
	4 Apply the software modelling tools like Catia for modelling of automotive components & structures					3						1		3	2

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
OEC5: Engineering Economics (BTMEC705A)	1 Apply the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, Benefit-cost ratio.											3		3	1
	2 Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions.											3		3	1
	3 Compare the life cycle cost of multiple projects using the methods learned, and make a quantitative decision between alternate facilities and/or systems.											3		3	1
	4 Compute the depreciation of an asset using standard Depreciation techniques to assess its impact on present or future value.											3		3	1
	5 Apply all mathematical approach models covered in solving engineering economics problems: mathematical formulas, interest factors from tables, Excel functions and graphs. Estimate reasonableness of the results.					3						3		3	1
	6 Examine and evaluate probabilistic risk assessment methods.											3		3	1
	7 Compare the differences in economic analysis between the private and public sectors. Recognize the limits of mathematical models for factors hard to quantify.											3		3	1
	8 Develop and demonstrate teamwork, project management, and professional communications skills									2		3		3	1



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Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
OEC5: Intellectual Property Rights (BTMEC705B)	1 State the basic fundamental terms such as copyrights, patents, trademarks, etc	1											1	2	2	
	2 Interpret laws of copyrights, patents, Trademarks and Various IP registration Processes							1					1	1	1	
	3 Exhibit the enhance capability to do economic analysis of IP rights, Technology and innovation related policy issyes and firms commercial strategies.		1						1						2	1
	4 Create awareness at all levels (research and innovation) to develop patentable technologies.										1		2	2	2	
	5 Apply trade mark law, copyright law, patent law and also carryout intellectual property audit.								1				1	1	1	
	6 Manage and safeguard the inttellectual property and protect it against unauthorised use.	1								2				1	2	

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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
OEC5: Wind Energy (BTMEC705C)	1 Understand historical applications of wind energy							2	2	2	1		1	1	1
	2 Understand and explain wind measurements and wind data		3	2	1	3	2	2	2	2			1	1	1
	3 Determine Wind Turbine Power, Energy and Torque	3	3	1	1	2	2	1					1	2	2
	4 Understand and explain Wind Turbine Connected to the Electrical Network AC and DC	3	3		1								1	1	1
	5 Understand economics of wind energy	3	2	1									1	1	1



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OEC5: Knowledge Management (BTMEC705D)	1 Define KM, learning organizations, intellectual capital and related terminologies in clear terms and understand the role of knowledge management in organizations.						1						3	3	1
	2 Demonstrate an understanding of the history, concepts, and the antecedents of management of knowledge and describe several successful knowledge management systems.												3	3	1
	3 Identify and select tools and techniques of KM for the stages of creation, acquisition, transfer and management of knowledge.												3	3	1
	4 Analyze and evaluate tangible and intangible knowledge assets and understand current KM issues and initiatives.							2					3	3	1
	5 Evaluate the impact of technology including telecommunications, networks, and internet/intranet role in managing knowledge.					3				2			3	3	1
	6 Identify KM in specific environments: managerial and decision making communities; finance and economic sectors; legal information systems; health information systems												3	3	1

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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Manufacturing Processes Lab - II (BTMEL706)	1 Utilize the concept of g code and m code and develop a part program for simple operations on cnc lathe machine	3	2	3	1	2				1	1		2	1	1
	2 Utilize the concept of g code and m code and develop a part program for simple operations on cnc milling machine	3	2	3	1	2				1	1		2	1	1
	3 Select the type of cnc machine for a particular operation and create cnc part program for given part drawing	3	2	3	1	2				1	1		2	1	1
	4 Determine mrr and twr in electrical discharge machining	3	1	1	2	1	2			1	2		2		
	5 Demonstrate the wire edm process	1	1	1	2	1	2			1	1		2	1	1
	6 Study the types of chips	2	2	1	1	1	1			1	1		1		



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Mechatronics Lab (BTMEL707)	1 Understand the various types of sensors and their applications	2	2							3			1	3	1
	2 Design a pneumatic circuit for a given application	1	1	3	3	3		3		3			1	3	2
	3 Design a hydraulic circuit for a given application	1	1	3	3	3		3		3			1	3	2
	4 Write a PLC program using Ladder logic	2		3	1	3		1		3			1	3	3
	5 Experiment PID controller for controlling temperature	1	1	3	3	3	3	2		3			1	3	3
	6 Demonstrate the capacitance sensor for measuring level	1	1	3	3	2		2		3			1	3	2

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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
CAD/CAM Lab (BTMEL708)	1 Construct CAD part models, assembly model and drafting of machine elements using CAD software.		2	1	1	3				3	3		2	1	1
	2 Evaluate stresses in components subjected to simple structural loading using FE software		3	3	3	3				3	2		2	3	3
	3 Write NC programs for turning and milling		1	2	1	3				3	2		2	3	3
	4 Describe case study of industrial robots	1		1		3		3	3	3	3	3	2	2	2

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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Seminar (BTMES709)	1 State the exact title of the seminar	2					2	2	2	2	1		1	1	2
	2 Explain the motivation for selecting the seminar topic and its scope								2		2		1	1	2
	3 Search pertinent literature and information on the topic	2					1	1	1	3	3		3	1	2
	4 Critically review the literature and information collected	2		1			2	1	2	2	2		2	1	2
	5 Demonstrate effective written and verbal communication										3		1	1	2



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Field Training/ Internship/ Industrial Training-III (BTMEF710)	1 To make the students aware of industrial culture and organizational setup		1	1			2		1			3	3	3	2
	2 To create awareness about technical report writing among the student.		1	1			2		1			3	2	2	2

Course/Subject with course code	Course Outcomes (COs)	Program Outcomes (POs)												PSOs	
		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Project Stage-I (BTMEP711)	1 State the exact title of the project and problem definition	1	1								1			2	2
	2 Explain the motivation, objectives and scope of the project								1	2	2			2	2
	3 Review the literature related to the selected topic of the project		1				1							2	2
	4 Design the mechanism, components of the system and prepare detailed drawings.			3	2	2		1		1	1	1	1	3	2
	5 Evaluate the cost considering different materials/ manufacturing processes	1		1					1			2	1	3	2

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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Fundamentals of Automotive Systems (BTMEC801A)	1 Identify the different parts of the automobile	2	2					1		1	1	1		1	1
	2 Explain the working of various parts like engine, transmission, clutch, brakes etc.,	1	1	3	3	3		3		3	3			2	2
	3 Demonstrate various types of drive systems	1	1	3	3	3		3		3	3			2	2
	4 Apply vehicle troubleshooting and maintenance procedures	2		3	1	3		1		1	3	3		2	2
	5 Analyze the environmental implications of automobile emissions. And suggest suitable regulatory modifications	1	1	3	3	3	3	3		3	3			3	2
	6 Analyze recent developments in the field of IC.Engines.	1	1	3	3	3		3		3	3			1	1



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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Non-Conventional Energy Resources (BTMEC801F)	1 To scale the energy usage and conventional energy resources	2			2			3					2	2	2
	2 To study Solar energy incident on earth, solar spectrum, overview of solar energy technologies, solar thermal devices	1	1		3			3						1	1
	3 Study Solar PV devices, Performance and durability of solar devices, Wind energy technologies	2	2		3			2						2	2
	4 Study geothermal and biomass, battery basics types	1	2		1			2					1	2	2
	5 Testing performance of Fuel cells, its processing and characteristics	3	3		2			3						1	1
	6 Study flywheels and super capacitors	1	2		1			2					1	2	1

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		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Project Stage-II/ Internship & Project (BTMEP803)	1 State the aim and objectives for this stage of the project	1	1											2	2
	2 Construct and conduct the tests on the system/product			2	2	2	1	1						2	2
	3 Analyze the results of the tests.		1			1	2		1		1			3	2
	4 Discuss the findings, draw conclusions, and modify the system/product, if necessary.			2	1	2	1	2			3		1	3	2