MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY BATHINDA-151001 (PUNJAB), INDIA

(A State University Estb. by Govt. of Punjab vide Punjab Act No. 5 of 2015 and Approved u/s 2(f) & 12 (B) of UGC; Member AIU)

Department: **Mechanical Engineering**

Program: B. Tech.

COURSE ARTICULATION MATRIX

Subject	S Code	Semester	Credit	Duration (Hrs)	L ST P	COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Environmental Science	BMNCC0-002	3rd	0	45	1 0 0	CO1	Technologies based on ecological principles and environmental regulations, which in turn helps in sustainable development.	-	-	3	-	-	2	3	-	-	-	-	-	3	-
						CO2	Conceptualize the processes and various factors involved in the formation of environment.	1	-	-	3	-	-	-	-	-	-	-	-	-	2
						CO3	Recognize the importance of environment and the sustainable natural resources.	-	-	-	-	-	-	3	-	-	-	-	-	-	2
						CO4	Use scientific reasoning to identify and understand environment problems and evaluate potential solution.	3	3	3	-	-	-	-	-	-	-	-	-	3	-

Course	Code	Sem	Cr			CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
						CO5	Identify the impacts of human activities on environment and role of society in these impacts.	-	-	-	-	-	-	-	-	3	-	-	2	-	2
STRENGTH OF MATERIAL-I	BMECS1-301	3rd	4	60	3 1 0	CO1	Understand the material properties, stress and strain and application Mohr's circle.	3	1	-	-	-	-	-	-	-	-	1	1	1	1
						CO2	Understand, apply, analyse and design the beams using the concept of bending moment, shear force and stress in beams.	3	2	2	2	2	2	2	-	-	-	2	2	1	1
						CO3	Understand, apply, analyse and design the beams. Column and struts using the concept of slope, deflection of beams and columns.	3	2	2	2	2	2	2	-	-	-	2	2	2	2
						CO4	Understand, apply, analyse and design the shafts and frames using the concept of forces and stresses.	3	2	2	2	2	2	2	-	-	-	2	2	1	1
THERMODYNAMICS	BMECS1-303	3rd	4	60	3 1 0	CO1	Ability to apply various thermodynamics laws to real system	3	2	-	-	-	-	2	-	-	-	-	1	1	1
						CO2	Understanding of the entropy of system and ideal gas equations	3	-	2	-	-	-	2	-	-	-	-	1	1	1
						CO3	An understanding of the interrelationship between thermodynamic cycles	-	3	3	2	-	-	1	-	-	-	-	1	2	1
						CO4	Ability to use Properties of Pure substances in real thermodynamics problems.	-	3	2	2	-	-	-	-	-	-	-	-	2	

Course	Code	Sem	Cr	Marks	L-T-P	CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
FLUID MECHANICS	BMECS1-302	3rd	4	60	3 1 0	CO1	Apply mathematical knowledge to predict the fundamental properties and characteristics of a fluid.	3	3	3	1	-	2	-	-	-	-	-	1	1	
						CO2	Can analyze and calculate major and minor losses associated with pipe flow in piping networks.	3	3	3	-	-	2	-	1	-	-	-	2	2	1
						CO3	Can mathematically predict the nature of physical quantities.	3	3	3	2	-	-	3	-	-	-	-	3	1	1
						CO4	Can critically analyze and evaluate the performance of different models and prototypes.	3	3	3	-	1	-	3	-	1	-	1	2	1	1
						CO5	Students will understand the Laminar and Turbulent behaviour of fluid under different conditions and analyze different type of losses in real fluid flow systems	3	3	3	3	-	-	3	-	-	-	-	3	1	
Mechanical Engineering Lab-I (Design-I)	BMECS1-304	3rd	2	30	0 0 2		Student will be able to measure the various mechanical properties of various materials.	3	2	1	1	2	1	1	1	2	1	1	1	1	1
							Student will be able to measure the bending stress and deflection in beams.	2	2	3	1	2	1	1	-	1	1	1	1	2	1
							Student will be able to measure the strain energy and spring stiffness of a helical spring.	2	3	2	1	2	1	1	-	1	1	1	1	1	1
							Student will be able to calculate load carrying capacity of long columns and their buckling strength.	2	2	3	2	2	1	1	-	1	1	1	1	1	2

Course	Code	Sem				CO	Course Outcome															
Engineering Mechanics	BMECE0-001	3rd	4	60	3 1 0		Students shall be able to understand problems related to Mechanics	1	1						2		1	1			2	1
							Shall be able to apply this knowledge to find solution of engineering problems			2							2			2	1
							This will make student learning life long	3	3	1					2	3	3	1			2	1
							Students can use knowledge in new areas														2	1
Basic Electronics &							1. To understand and analyze basic DC and AC circuits.	2	3											1	3
							2. To study the use and working principle of single-phase transformers.	2					3							1	3
							3. To study the application and working principles of three phase and single-phase induction motors.	2					3							1	3
							4. To introduce to the components of low voltage electrical installations.	2					3							1	3
FLUID MACHINES	BMECS1-403	4TH	4	60	3 1 0	CO1	Students will be able to learn general concepts of fluid and turbo machinery..	3	3	3	-	-	3	-	-	1	-	-	1	1	1
						CO2	Can critically analyze the performance of different types of turbines.	3	3	3	-	-	2	-	-	-	1	-	2	2	1
						CO3	Can critically analyze the performance of different types of pumps	3	3	3	-	-	-	-	-	1	1	1	2	1	1

Course	Code	Sem	Cr	Hrs	L-T-P	CO	Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
						CO4	Can critically analyze working of practical hydraulic systems.	3	3	3	-	-	-	1	-	-	-	3	-	2	1
						CO5	Able to evaluate working and performance of various turbo machines.	3	-	-	3	1	1	-	1	-	-	-	2	1	1
						CO6	Analyze and create practical hydraulic systems.	-	3	3	3	-	-	-	1	-	2	2	1	1	1
Applied Thermodynamics	BMECS1-404	4TH	4	60	3 1 0	CO1	The students will get a good understanding of various practical power cycles and heat pump cycles.	3	3	-	-	-	-	-	-	-	-	-	-	1	1
						CO2	The students will be able to analyze energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers, steam turbines and reciprocating compressors.	3	3	-	1	-	-	1	-	-	-	-	-	2	1
						CO3	The students will be able to understand phenomena occurring in high speed compressible flows	3	2	-	-	-	-	-	-	-	-	-	-	1	1
Industrial Automation &	BMECS1-E 1.3	4TH	3	45	3 0 0	CO1	Understand the necessity of automation.	3	2	---	---	2	2	2	2	3	--	3	3	2	1
						CO2	Implementation of fluid power control elements in modern industry.	3	3	3	3	3	2	3	3	3	---	3	3	1	1
						CO3	Design automatic Material handling systems	3	2	2	3	3	3	2	2	3	--	3	3	2	1
						CO4	Design and control of robotic manipulators.	3	3	3	3	3	3	2	2	2	--	3	2	2	1

Course	Code	Sem	L	Hrs	—	CO	Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Machine Drawing using CAD	BMECS1-405	4TH	3	45	104	CO1	To make students understand the principles and requirements of production drawings.	3	-	1	-	-	-	-	-	-	-	1	-	1	1
						CO2	To understand how to assemble and disassemble important parts used in major mechanical engineering applications.	3	-	-	-	-	-	-	-	-	1	-	-	1	1
						CO3	To understand the better utilization of software like AutoCAD	1	-	-	1	-	1	-	-	1	-	-	2	2	1
						CO4	Student gets aware about the free hand drawings of the different joints.	3	1	1	-	-	-	-	-	1	2	-	3	1	
Materials Engineering	BMECS1-401	4TH	3	45	300	CO1	Student will be able to identify crystal structures for various materials and understand the defects in such structures.	3	3	2	3	3	1	1	---	---	--	2	3	1	1
						CO2	Understand how to tailor material properties of ferrous and non-ferrous alloys.	3	3	3	1	3	1	2	---	---	---	3	3	2	1
STRENGTH OF	BMECS1-402	4TH	4	60	310	CO1	Understand the concept of strain energy and various theories of failure.	3	1	-	-	-	-	-	-	-	-	1	1	1	2
						CO2	Understand, apply, analyse and design the thin and thick cylinders, rotational discs through the concept of stress calculation.	3	2	2	2	2	2	2	-	-	-	2	2	2	1

Course	Code	Sem				CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
						CO3	Understand, apply, analyse and design the curved beams and beams through the concept of stress calculation in curved beams and shear stress in beams.	3	2	2	2	2	2	2	-	-	-	2	2	1	1
						CO4	Understand, apply, analyse and design of open and closed helical spring, leaf spring, flat spiral spring through the concept of calculation of strain energy and stresses.	3	2	2	2	2	2	2	-	-	-	2	2	2	1
MECHANICAL ENGINEERING LABORATORY	BMECS1-406	4TH	1	30	0 0 2	CO1	The students will be able to measure various properties of fluids.	3	3	-	-	1	-	-	-	2	-	-	-	2	1
						CO2	The students will be able to characterize the performance of fluid/thermal machinery	3	3	-	-	2	-	1	-	2	-	-	-	1	2

COURSE ARTICULATION MATRIX (STUDY SCHEME: 2019)

Subject	S Code	Semester	Credit	Duration (Hrs)	L T P	COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Automobile Engineering	BMECS1 - 503	5	3	45	3 0 0	CO1	Know the layout, constructional and working of power unit and fuel supply system of an automobile.	3	3	3	1	1	2	2	2	3	2	1	2	1	1
						CO2	Know the functioning of lubrication, cooling and suspension system of an automobile.	3	3	3	1	1	2	-	1	3	1	1	2	2	1
						CO3	Know construction and working of transmission, steering and braking system of an automobile.	3	3	2	2	1	1	-	2	3	2	1	2	2	1
						CO4	Know working of starting and electrical systems of an automobile. Also get knowledge of recent developments in the automobile field.	3	3	3	2	2	2	2	2	3	3	3	3	1	1
HEAT TRANSFER	BMECS1-501	5	4	45	3 1 0	CO1	Formulate and analyze a heat transfer problem involving any of the three modes of heat transfer	3	3	2	1	1	2	2	1	2	1	2	2	2	1
						CO2	Obtain exact/approximate solutions for the temperature variation using analytical methods where possible or employ approximate methods or empirical correlations to evaluate the rate of heat transfer.	3	3	3	3	2	2	2	1	2	1	2	2	1	1

Course	Code					CO	Description															
						CO3	Design devices such as heat exchangers and also estimate the insulation needed to reduce heat losses where necessary.	3	3	3	3	3	2	3	1	2	1	1	2	2	1
						CO4	Apply the boiling and condensation heat transfer principles to engineering problems.	2	2	3	3	2	2	3	1	2	1	1	2	1	1
Industrial Training	BMECD1-722	5	3	06 weeks	0 0 0	CO1	Ability to use knowledge to solve industrial problems.	3	3	3	3	2	-	1	-	3	1	-	1	1	2
						CO2	Understand general and specific working procedures in the field of engineering.	3	3	3	3	3	2	2	-	2	1	-	1	2	2
						CO3	An understanding of the impact of engineering solutions and industrial safety.	2	3	3	3	3	3	3	-	-	1	-	-	2	1
						CO4	Ability to communicate effectively in the working environment.	2	2	3	2	2	3	3	1	1	3	1	-	1	1
KINEMATICS AND THEORY OF MACHINES	BMECS1-504	5	4	60	3 1 0	CO1	The primary object of the course is to make the student understand the concept of: displacement, velocity and acceleration of simple mechanisms, cams and cam profiles of various cams, using different followers and motions.	3	2	-	-	1	-	-	-	1	-	-	2	1	2

Course					CO	Course Outcome														
					CO2	The students will able to understand constructional and working features of important machine elements.	3	1	2	1	1	-	-	-	1	-	-	2	2	2
					CO3	The students should be able to understand various parts involved in kinematics of machines including balancing of single and multiple rotating masses Gyroscopic motion and couples.	3	2	3	1	3	-	1	-	-	-	-	2	1	1
					CO4	The students should be able to understand gear trains, belt rope and chains, and governors	3	2	2	2	2	1	1	-	-	-	-	3	2	1
MECHANICAL ENGINEERING LABORATORY-III (MMM & HT)	5	1	0 0 2		CO1	Define metrology and apply concept of metrology to engineering applications	3	2	2	3	3	2	2	1	1	2	2	3	3	2
					CO2	Understand the basic measurement units and able to calibrate various measuring devices.	3	1	2	3	3	2	1	1	2	3	1	3	1	1
					CO3	Use measuring tools such as Sine bar, surface roughness tester, profile projector, Tool Maker Microscope, stroboscope, Micrometer, etc.	3	2	1	3	3	1	1	1	3	3	2	3	2	2
					CO4	Perform steady state conduction experiments to estimate temperature distribution and thermal conductivity of different materials	3	3	3	3	3	2	3	1	3	2	2	3	1	2

Course	Code					CO	Outcome	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	PS1	PS2
						CO5	Perform transient heat conduction experiments	3	3	3	3	3	2	2	1	3	2	2	3	2	1
						CO6	Estimate heat transfer coefficient in natural, forced convection and condensation and boiling process also.	3	3	3	3	3	2	2	1	3	2	2	3	2	1
						CO7	Determine surface emissivity of different surfaces and Stefan Boltzmann's constant	3	3	3	3	3	2	2	1	3	2	2	3	2	1
MECHANICAL ENGINEERING LABORATORY-IV (AE & TOM)	BMECS1-506	5	1	0 0 2		CO1	To deliver basic knowledge of different components of automobiles	3	3	2	2	2	2	1	-	2	-	2	3	1	1
						CO2	To understand functioning of different systems of automobile.	3	2	1	-	1	-	1	-	-	-	-	2	2	2
						CO3	To enhance knowledge of fault diagnosis and troubleshooting capabilities of different systems of an automobile.	3	3	3	1	1	1	1	-	-	-	-	2	2	2
						CO4	The main objective of the course is to make the student understand regarding link pair and chains, motorized gyroscope, gear and gear trains and Cams, also knowledge of gyroscopic effect, gyroscope active and reactive couple for ships.	3	3	3	3	1	1	1	-	1	1	-	3	2	1

Course	Code					CO	Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Mechanical Measurement & Metrology	BMECS1-502	5	3	45	300	CO1	Understand the classification of measurements and measurement standards used in industrial applications. To introduce concepts of linear, angular, roughness thread, gear measurements, limits, fits and tolerances.	3	3	3	2	3	2	2	---	2	--	3	3	2	1
						CO2	Understand about various errors in measuring systems and evaluate the errors by statistical methods.	3	3	2	2	3	1	1	---	---	---	3	3	2	1
						CO3	Know about functions and types of sensors and transducers and their utility in instrumentation.	3	3	3	---	3	---	---	---	---	---	2	3	1	2
						CO4	Use various instruments for measurements like pressure, flow, temperature etc. In process industry manufacturing.	3	3	3	2	3	1	---	---	---	---	2	3	2	1
Automation in Manufacturing	BMECD1-623	6	3	45	300	CO1	Understanding operating principles and constructional features of hydraulic and pneumatic systems.	3	2	---	---	2	2	2	2	3	--	3	3	1	2
						CO2	Choose appropriate PLC and explain the architecture, installation procedures and trouble shooting and can develop PLC programs using various functions of PLCs for a given application.	3	3	3	3	3	2	3	3	3	---	3	3	2	1

Subject	Code					CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
						CO3	Explain the application development procedures in SCADA and manage data, alarm, storage and can explain the architecture of DCS.	3	2	2	3	3	3	2	2	3	--	3	3	1	2
						CO4	Describe the advanced controller elements and program methods.	3	3	3	3	3	3	2	2	2	--	3	2	1	1
Design of Machine Elements	BMECS1-602	6	4	60	3 10	CO1	Concept of machine design and procedure for selection of materials	3	3	3	2	--	--	--	--	--	--	--	3	2	2
						CO2	An overview of the design methodologies employed for the design of various machine components	3	3	3	2	--	--	--	--	--	--	--	3	2	1
						CO3	Understand the relationship between component level design and overall machine design	3	3	3	3	--	--	--	--	--	--	--	3	1	1
						CO4	Understand the concept of design software and their utility/ application for designing of different machine components	3	2	3	--	3	--	--	--	--	--	--	3	2	2
Gas Dynamics and Jet Propulsion	BMECD1-612	6	3	45	3 00	CO1	To apply the concepts of compressible flow.	3	2	---	---	2	2	2	2	3	--	3	3	2	1
						CO2	To understand the phenomenon of Shock Waves.	3	3	3	3	3	2	3	3	3	---	3	3	2	2
						CO3	To apply gas dynamics principles to jet propulsion.	3	2	2	3	3	3	2	2	3	--	3	3	2	1

Subject	Code					CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
						CO4	To understand the working of rocket engine and propellants.	3	3	3	3	3	3	2	2	2	--	3	2	1	2
Internal Combustion Engines	BMECD1-611	6	3	45	3 0 0	CO1	The basics of IC engines	3	2	---	---	2	2	2	2	3	--	3	3	1	1
						CO2	Fuel supply and combustion in IC Engine	3	3	3	3	3	2	3	3	3	---	3	3	2	2
						CO3	Engine cooling and lubrication	3	2	2	3	3	3	2	2	3	--	3	3	2	1
						CO4	Testing and control of engine emissions.	3	3	3	3	3	3	2	2	2	--	3	2	1	1
Major Project	BMECS1-605	6	1		0 0 2	CO1	Ability to plan and implement an investigative or developmental project given general objectives and guidelines.	3	3	3	2	1	1	1	2	1	1	2	1	1	1
						CO2	In-depth skill to use some laboratory, modern tools and techniques.	1	1	1	1	3	2			1		1	2	2	2
						CO3	Ability to analyze data to produce useful information and to draw conclusions by systematic deduction.	1	1	3	3	1		1		2	1	2	1	2	1
						CO4	Facilitate significant individualized interactions between faculty members and students through a multi-term research experience.	1	1		1		2			3	2	1	1	1	1
Manufacturing Technology &	BMECS1-601	6	4	60	4 0 0	CO1	Able to apply knowledge of manufacturing processes and the skills to develop and manipulate the operating parameters for a given process.	3	3	3	2	2	2	1	---	---	--	2	3	2	1

Course	Code				CO	Course Outcome														
					CO2	Able to understand processing of plastic and ceramic materials.	3	2	1	2	2	1	2	---	---	---	2	3	2	1
					CO3	Ability to understand the latest technologies in casting and welding processes will get increased.	3	3	1	2	3	1	2	---	---	---	3	3	2	2
					CO4	Students will be able to come up with innovative conceptual idea about latest manufacturing processes and their industrial applications.	3	3	3	3	2	2	1	---	---	---	2	3	1	1
Mechanical Lab- V(MP)	BMECS1-603	6	1	0 0 2	CO1	Understand the different manufacturing and fabrication processes which are commonly employed in the industry, to fabricate components using different materials.	3	3	3	3	2	2	1	---	1	--	2	3	1	1
					CO2	Fabricate components with their own hands.	3	3	3	1	3	1	1	---	2	---	2	3	2	1
					CO3	Acquire the practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.	3	3	1	1	3	1	1	---	---	---	1	3	1	1
Mechanical Lab- VI (MSM)	BMECS1-604	6	1	0 0 2	CO1	Analyse the microstructure of different ferrous and non-ferrous samples.	3	3	1	3	3	1	2	2	3	1	1	3	2	1
					CO2	Explore the effect of heat treatment on various engineering materials by analysing its microstructure and hardness.	3	3	1	3	3	1	2	2	3	1	1	3	2	1

Subject	Code					CO	Course Outcome														
MICROPROCESSORS IN AUTOMATION	BMECD1-622	6	3	45	3 0 0	CO1	Define Microprocessor and Microcontroller family and working of 8085 Microcontroller Architecture and Programming model.	3	3	1	3	3	1	2	2	3	1	1	3	2	1
						CO2	Understand the programming of 8085 and 8255 microprocessors.	3	3	1	3	3	1	2	2	3	1	1	3	2	1
						CO3	Understand the concept of Timer, Interrupt, I/O Port interfacing with 8251/8253 microcontroller and advanced features of 8086/8088.	3	3	1	3	3	1	2	2	3	1	1	3	1	2
						CO4	Understand the concept of digital control interfacing with Real time system.	3	3	1	3	3	1	2	2	3	1	1	3	2	1
Power Plant Engineering	BMECD1-613	6	3	45	3 0 0	CO1	Describe sources of energy and types of power plants.	2	1	1	1	1	2	3	1	1	2	1	2	2	1
						CO2	Analyze different types of steam cycles and it's efficiencies in a steam power plant,	3	3	3	3	2	2	2	1	2	3	1	3	2	1
						CO3	Describe basic working principles of gas turbine and diesel engine power plants.	2	1	1	1	1	2	3	1	3	2	1	3	1	2
						CO4	Define the performance characteristics and components of such power plants.	3	3	3	3	2	2	1	1	3	2	1	3	2	1
						CO5	List the principal components and types of nuclear reactors.	2	1	1	1	1	1	1	1	2	2	2	3	2	
						CO6	List types, principles of operations, components and applications of steam turbines, Steam generators, condensers, feed water and circulating water systems.	2	2	2	2	2	2	2	1	2	2	2	3	2	

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Mechatronic Systems	BMECD1-621	6	3	45	3 0 0	CO7	Estimate different efficiencies associated with power plant systems.	3	3	3	3	2	2	3	1	3	2	2	3	1	1
						CO1	Understand the basics and key elements of Mechatronics design process	3	1	1	1	2	2	1	1	2	1	1	3	2	1
						CO2	Familiar with basic system modelling	3	1	1	1	3	2	1	1	2	1	1	3	2	1
						CO3	Understand the concepts of engineering system and dynamic response of the system	3	2	1	1	3	2	1	1	2	1	1	3	1	2
						CO4	Realize the concepts of real time interfacing and data acquisition	3	2	1	1	3	2	1	1	2	1	1	3	2	1

Subject	S Code	Semester	Credit	Duration (Hrs)	L T P	COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Advanced Fluid Mechanics	BMECD1-724	7	3	45	3 0 0	CO1	To develop the solutions of ideal fluid flows	2	2	3	3	1	1			1	1	1	2	2	1
						CO2	To apply the knowledge of fluid mechanics governing equation	1	2	3	3	1	1	1	1	1			1	2	1
						CO3	To develop solutions for near wall flows	1	3	3	3	2	1	1			1	1	1	2	1
						CO4	Apply the mathematical modeling techniques for fluid mechanics problems		3	3		2	2	1					1	2	1

Course	Code	L	T	P	Marks	CO	Description	1	2	3	4	5	6	7	8	9	10	11	12		
Additive Manufacturing	BMECD1-713	7	3	45	300	CO1	Understand the importance of RP technology in view of product development and innovation in various fields.	3	2	---	---	2	2	2	2	3	--	3	3	3	1
						CO2	Implement the knowledge, techniques, skills of Product Prototyping and modern tools like CAD.	3	3	3	3	3	2	3	3	3	---	3	3	2	1
						CO3	Understand the various RP techniques and manufacturing methods that enable student to provide solution to Rapid prototyping problems.	3	2	2	3	3	3	2	2	3	--	3	3	3	1
						CO4	Demonstrate comprehensive knowledge of the broad range of RP tooling, application area of RP and indirect methods of RP tooling production.	3	3	3	3	3	3	2	2	2	--	3	2	2	1
Composite Materials	BMECD1-722	7	3	45	300	CO1	Learn various composite materials and their applications.	3	-	2	-	3	2	2	-	-	-	3	3	2	2
						CO2	Understand PMC and their processes.	3	-	3	2	3	1	2	-	-	-	3	2	2	1
						CO3	Learn about Metal matrix Composites and their processes.	3	1	3	2	1	-	-	-	-	-	2	2	3	1
						CO4	Understand to develop Ceramic Matrix Composites.	3	1	2	1	3	-	-	-	-	-	3	3	2	1

Course	Code					CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12		
Computer Aided Design	BMECD1-711	7	3	45	3 0 0	CO1	To apply the basics of design software and hardware requirements for designing of mechanical component using computer.	3		3	2	3						3	3	2	2
						CO2	Make the representation of curves, surfaces and solids.	3	2	3	1	3						2	2	2	1
						CO3	Understand the concepts of visual realism of models and assembly of components.	3	3	3	1	3						3	3	3	1
						CO4	Describe CAD Standards and concepts of design of components using FEM.	3	3	1		3						3	3	2	1
Heat exchanger Design	BMECD1-714	7	3	6 week	0 0 0	CO1	Understand the basic concept and design methodology of heat exchangers.	3	2	3	1	1		2					2	3	2
						CO2	Predict the thermal performance important heat-exchanger design parameters due to fouling.	1	3	2	2	2		1						1	3
						CO3	Determine general design requirements for different types of heat exchangers.	2	2	3	2	1		1				2	1	2	2
						CO4	Analyze performance evaluation of different heat exchanger and phase change heat exchangers	1	2	2	2	1		1		1		1	1	1	2
Industrial Training	BMECS1-704	7	3	45	3 0 0	CO1	To enable students to implement Project Planning in their Industrial In-plant Training Project work.	2	3	3	3	3	1	1	-	1	1	-	-	1	3

Course	Code	L	T	Hrs	Type	CO	Description	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
						CO2	To understand the concept of Facility, Location & Layout & implement in Industry.	1	1	-	-	-	3	3	-	2	1	1	1	2	2
						CO3	Develop the ability to work as an individual and in group with the capacity to be a leader or manager as well as an effective team member.	1	-	1	1	1	3	3	3	3	2	2	2	1	2
						CO4	Master the professional and ethical responsibilities of an engineer.	-	-	-	1	-	3	2	3	3	3	2	1	2	3
MECHANICAL ENGINEERING LABORATORY-VII	BMECS1-702	7	1	30	0 0 2	CO1	To model machine parts, its assembly and design analysis using software.	3	3	2	1	2	-	-	-	-	-	-	2	2	1
						CO2	To learn the modeling of geometrical transformations, curves, surfaces and solids.	3	2	3	2	2	1	1	-	-	1	-	2	2	2
						CO3	To understand the part programming for CNC Machines.	3	3	2	1	3	-	-	-	-	-	-	3	3	2
						CO4	To learn the programming of robots	3	3	1	1	1	-	-	-	-	-	-	2	2	2
Mechanical Vibrations	BMECD1-723	7	3	45	3 0 0	CO1	The student will be able to understand fundamental principles, types and applications of mechanical vibrations and their measuring instruments.	3	2											2	1
						CO2	The student will be able to understand and solve for natural frequency of single degree of freedom system with free, damped and forced vibrations.	3	3	1	1		1							2	2

Course	Code					CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
						CO3	The student will be able to understand and solve for natural frequency of two degree and multi-degree of freedom systems.	3	3	1	1		1							3	2
						CO4	The student will be able to understand vibrations in continuous systems such as string, bars, beams and circular shafts.	3	2											2	1
Non-Destructive Testing	BMECD1-721	7	3	45	3 0 0	CO1	Explore Basic principles, scope and applications of Non-Destructive Testing technique.	3	2	2	1	3	3	3	---	---	--	2	3	2	2
						CO2	Apply fundamental concepts of Non-Destructive Testing to select the appropriate technique for a given application.	3	3	2	3	3	1	2	---	1	---	2	3	3	2
						CO3	Detect any defects in ferrous and nonferrous metals, plastics by utilizing underling principle of Ultrasonic testing.	3	3	2	3	3	2	1	---	1	---	2	3	3	2
						CO4	Distinguish various nondestructive techniques, advantages and disadvantages of individual technique. Even more, will be able to interpret the concept of radiography.	3	2	3	2	3	2	1	---	---	---	2	3	2	2

Subject	Code					CO	Statement															
Mechanical Engineering Laboratory-VIII	BMECS1-703	7	1	30	0 0 2	CO1	Apply the fundamental principles of refrigeration and air conditioning system.	3	2	2	1	1	-	-	-	-	-	-	2	2	2
						CO2	Compute the cooling capacity and coefficient of performance by conducting test on vapour compression and vapour absorption refrigeration systems.	3	3	3	2	1	-	-	-	1	-	-	2	2	2
						CO3	Calculate cooling load for air conditioning systems used in large buildings.	3	3	3	3	2	2	1	-	1	-	-	2	2	1
						CO4	Will explore the psychometric concept during visit to a central Air conditioning plant and further apply this concept in performance testing of window type room air conditioner.	3	2	2	2	2	2	-	-	-	-	-	2	2	2
Refrigeration and Air conditioning	BMECS1-701	7	3	45	3 0 0	CO1	Understand the fundamental principles, operate, and analyze the refrigeration and air conditioning systems.	3	3	2	-	1	-	-	-	2	-	-	-	3	2
						CO2	Compute cooling capacity and coefficient of performance of various refrigeration systems.	3	3	3	2	1	-	-	-	2	-	-	-	2	2
						CO3	Present the properties, applications, environmental issues of different refrigerants	3	1	-	-	2	2	3	-	1	-	-	-	2	1
						CO4	Calculate cooling load for air conditioning systems used for various applications.	3	3	3	2	2	-	-	-	1	-	-	-	2	2

Course	Code	L	T	H	Marks	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PROCESS PLANNING AND COST ESTIMATION	BMECD1-812	8	3	45	300	CO1	Understand various contributing factors in process planning.	3	1	1	1	1	3	-	-	1	1	3	3	2	2
						CO2	Estimate various cost elements.	3	3	3	2	3	2	-	-	2	1	3	3	2	2
						CO3	Estimate machining time.	3	3	3	2	3	2	-	-	2	1	3	3	2	2
						CO4	Estimate the production cost.	3	3	3	2	3	2	-	-	2	1	3	3	2	2
Energy Conservation and Management	BMECD1-815	8	3	45	300	CO1	Analyse the energy and power scenario prevalent to the world.	3	3	3	3	3	3	3	-	3	1	3	3	2	2
						CO2	Understand the concept of HT & LT supply and the concept of lighting.	3	3	3	2	3	2	3	-	2	1	3	3	2	2
						CO3	Learn the consumption pattern of power in thermal systems.	3	3	3	2	3	2	3	-	2	1	3	3	2	2
						CO4	Understand the power consumption pattern in major utilities.	3	3	3	2	3	2	3	-	2	1	3	3	2	2
Operations Management	BMECD1-822	8	3	45	300	CO1	Understand the fundamental theory of operation management and various stages of product design and development.	1										2	2	2	3
						CO2	Make forecasts in the manufacturing and service sectors using selected quantitative and Qualitative techniques.	1	2	2		2				1		2	2	2	2

Course	Code					CO	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12	13	14
						CO3	Apply the principles and techniques for planning and control of the production and service systems to optimize/make best use of resources.	1	2	3	3	3	2			1		2	2	2	2
						CO4	Understand the role of information system in quality control.	1								2				1	2
Operations Research	BMECD1-821	8	3	45	3 0 0	CO1	Apply the concept of linear programming.	3	2		2	2								2	3
						CO2	Solve Transportation and Assignment Problems.	3	2		2	2								2	2
						CO3	Apply the concept of queuing and network modeling.	3	2		2	1								2	2
						CO4	Employ non-linear programming model, inventory model and game theory.	3	1		1									1	1
Sustainable Manufacturing	BMECD1-823	8	3	45	3 0 0	CO1	Understand concept of sustainability and sustainable manufacturing.	2						2	3					2	2
						CO2	Learn the concept of Green Manufacturing and Environmental impact assessment.	2						2	3					2	2
						CO3	Apply the concept of lean principles and implementation.	2	2						3					2	2
						CO4	Understand the concept of product recovery management.	2							3					1	1

Course	Code					CO	Course Outcome														
Total Quality Management	BMECD1-813	8	3	45	300	CO1	Understand the concept of Quality and the implication of Quality on Business.	1		2		2	2			3		2	2	2	2
						CO2	Apply total quality management principles and processes.	1	2	2	1	3				3		1	3	2	2
						CO3	Apply TQM tools and techniques and performance measures.	1	2	3	2	3				2		2	2	2	2
						CO4	Get the knowledge of new developments in ISO 9000 and overview of other sector specific quality standards.	1	2				1					2	3	1	2
Industrial Safety and Environment	BMECD1-811	8	3	45	300	CO1	Understand importance of safety at work	1		3			2	2					1	1	2
						CO2	Understand various safety measures and importance of standards for safety	1		2		1	1			1		2		2	1
						CO3	Understand basics of environmental design		1	3						1	3	1		2	1
						CO4	Understand the control of Ventilation and heat etc			2	1					2		1		2	1

So on…….. (1st semester to last semester)