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: M. Tech.

COURSE ARTICULATION MATRIX

Subject	S Code	Semester	Credit	Duration (Hrs)	L ST P	COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
Advanced heat and mass transfer	MREM0-102	IST	4	60	4 0 0	CO1	Analyze the analytical and numerical solutions for heat transfer problem.	3	2	1	-	-	--	1	-	3	1	2
						CO2	able to solve problems related to convective and radiation heat transfer	3	1	1		1		1		2	1	1
						CO3	Able to model multidimensional and transient heat transfer conditions	1	2	3						2	1	1
						CO4	Able to analyses mass transfer problems	2	2	1						2	1	2

Course	Code	Sem	L	Marks		CO	Course Outcome											
Advanced Machine Design	**MREM0-104**	I ST	4	60	4 0 0	CO1	Understand the review of machine design.	1	1	1	1	1	1	1	1	2	3	1
						CO2	Learn about the concept of contact stresses.	1	1	1	1	1	1	1	1	3	2	3
						CO3	Understand the concepts of fracture and creep in detail.	1	2	2	1	1	1	1	1	3	2	2
						CO4	Understand about the concept of reliability.	1	2	2	2	1	1	1	1	3	2	3
Composite Materials	MMEE2-156	IST	4	60	4 0 0	CO1	Learn the basics of composite materials and processing techniques	1	2	1	1	1	1	1	1	3	2	3
						CO2	Understand Fabrication Methods.	1	2	2	1	1	1	1	1	2	2	3
						CO3	Learn about the concept of laminated plates.	1	2	1	2	1	1	1	1	2	3	2
						CO4	Understand the concept of Sandwich Constructions.	2	2	2	1	1	1	1	1	2	2	3

Subject	Code		CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2
GAS DYNAMICS	MMEE8-157	IST / 4 / 60 / 60 / 4 0 0	CO1	To apply governing equations to practical problems involving compressible fluid flow.	2	1	2	2	1	1	1	-	3	1	2
			CO2	To analyze compressible flow and normal shock through variable area duct critically.	1	2	1	2	1		1	-	2	1	2
			CO3	To apply principles of fluid mechanics to propulsive system.	1	1	1	1	1		1	-	2	1	1
			CO4	To interpret propulsive systems for their working and application.	2	1	2	2	1	1	1	-	3	2	1
			CO5	To apply governing equations to practical problems involving compressible fluid flow.	2	1	1			1			2	1	2
:Research Methodology	MMEE0-101	1 ST / 4 / 60 / 4 00	CO1	The ability to formulate research problem using appropriate methods.	2	2	3	1	-	2	1	2	1	2	2
			CO2	The ability to organize and conduct research in a more appropriate way	2	3	2	2	1	2	1	2	1	2	3
			CO3	Develop skills in qualitative and quantitative data analysis and presentation	2	3	1	1	1	2	2	3	1	1	2
			CO4	Demonstrate enhanced writing skills	1	1	2	1	2	3	3	1	-	3	2

ADVANCE MANUFACTURING PROCESSES	MMEE2-103	I ST	4	60	4 0 0	CO1	To categorize different material removal, joining processes as per the requirements of material being used to manufacture end product.	1	1	1	1	1	1	1	1	3	2	3
						CO2	To select material processing technique with the aim of cost reduction, reducing material wastage & machining time.	2	1	2	2	1	1	1	1	2	2	3
						CO3	To identify the process parameters affecting the product quality in various advanced machining of metals/ non-metals, ceramics and composites.	1	1	2	1	1	1	1	1	2	3	3
						CO4	To combine & develop novel hybrid techniques from the state of art techniques available.	3	3	3	3	2	1	1	1	2	3	3
FINITE ELEMENT MODELLING	MMEE2-158	IS T	4	60	4 0 0	CO1	Understand the concepts behind formulation methods in FEM.	1	1	1	1	1	1	1	1	3	3	3
						CO2	Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.	2	1	2	2	1	1	1	1	2	3	2
						CO3	Develop element characteristic equation and generation of global equation.	3	3	3	3	2	1	1	1	2	3	2

Subject	Code	Exam	L	P	Hrs	L-T-P	CO	Course Outcome	1	2	3	4	5	6	7	8	9	PSO1	PSO2
							CO4	Able to apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi symmetric and dynamic problems and solve them displacements, stress and strains induced.	3	3	3	2	1	1	1	1	2	2	3
Mechatronics	MMEE2-157	IST	4	60		4 0 0	CO1	Identification of key elements of mechatronics system and its representation in terms of block diagram	1	1	1	1	1	1	1	1	3	3	3
							CO2	Development of PLC ladder programming and implementation of real life system.	3	3	2	3	2	1	1	1	3	3	3
							CO3	Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O	1	1	2	2	1	1	1	1	3	3	3
							CO4	Interfacing of Sensors, Actuators using appropriate DAQ micro-controller	2	1	2	2	1	1	1	1	3	3	3
LAB-1	MMEE2-105	IST	2	30		0 0 4	CO1	Apply modern tools and skills in design and manufacturing to solve real world problems.	2	3	3	3	2	1	1	1	3	3	2
							CO2	Apply managerial concepts and principles of management and drive global economic growth.	2	3	3	3	2	1	1	1	3	3	3
							CO3	Apply thermal, fluid and materials fundamental knowledge and solve problem	2	3	3	3	2	1	1	1	3	3	3

Course	Code	Sem	L	Credits	Marks	CO	Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
						CO4	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data.	2	3	3	3	2	1	1	1	3	3	2
Advanced CAD/CAM	MMEE2-207	2nd	4	60	4 00	CO1	Understand advanced computer aided design techniques.	1	1	2						3	-	-
						CO2	Learn to 2D Geometric transformations.	1	2	3						3	2	-
						CO3	Understand the concepts representation of solids.	2	2	2						3	2	3
						CO4	Understand about the concept reverse engineering.	2	2	2						3	3	3
Advanced Optimization Techniques	MMEE2-209MMEE2-209	2nd	4	60	4 00	CO1	To apply the concept of linear and non-linear to solve problems	2	1	2	1	1	1	1	1	2	1	2
						CO2	To solve problems related to Transportation and Assignment.	2	1	2	1	1	1	1	1	2	1	3
						CO3	To apply the concept of queuing and network modeling	2	1	1	1	1	1	1	1	2	1	3
						CO4	The ability to model the real problem of industry and society.	1	1	1	1	1	2	1	1	1	1	3

Course	Code	Sem	Cr			CO	Course Outcome											
CFD	MMEE2-206	2nd	4	60	4 0 0	CO1	Understand and be able to numerically solve the governing equations for fluid flow	2	1	1	2		1	1		3	1	1
						CO2	Understand and apply finite difference, finite volume and finite element methods to fluid flow problems	3	1	2			1			2	2	1
						CO3	Generate and optimize the numerical mesh	2	2	2			1			1	1	3
						CO4	Be able to numerically solve a heat transfer problem	1	1		2			1		1	1	3
Industrial Automation and Robotics	MMEE2-208	2nd	4	60	4 0 0	CO1	Identify key elements of mechatronics system and its components.	1	1	1	1	1	1	1	1	1	1	-
						CO2	Describe the working of automatic material handling system and workstations.	1	1	1	1	1	1	1	1	1	2	1
						CO3	Understand the importance and application of various industrial controls in automation in industries	1	2	2	1	1	1	1	1	2	2	1
						CO4	Understand simulated automation technology in industries.	1	2	2	1	1	1	1	1	2	2	1
Welding Metallurgy	MMEE2-260	2nd	4	60	4 0 0	CO1	Student will be able to identify crystal structures for various materials and understand the defects in such structures.	1	1	1	1	1	1	1	1	3	3	2
						CO2	Understand how to tailor material properties of ferrous and non-ferrous alloys.	1	1	1	1	1	1	1	1	3	3	3

Course	Code	Sem	L	Hrs	P	CO	Outcome											
LAB-II	MEE2-210	2nd	2	30	0 04	CO1	Students will be able to communicate, gain leadership qualities	1	1	1	1	1	1	3	1	2	1	2
						CO2	Will be able to face actual problems in field	3	2	2	2	1	1	1	1	2	1	-
						CO3	Will become responsible towards society	1	1	1	1	1	1	1	2	1	1	2
						CO4	Will be able to solve specified need	3	2	2	1	1	1	1	1	-	1	1
Maintenance and Reliability Engineering	MMEE2-311	3rd	4	60	4 00	CO1	Understand the fundamental principles, functions adapted in industry for the successful management of maintenance and reliability activities.	2	1	2		1				1	-	2
						CO2	Understand the strategic role of Maintenance/Reliability engineering in asset life cycle optimization	2	2	2	1	2				1	2	3
						CO3	Identify and apply appropriate maintenance strategy	3	1	2		2				1	2	3
						CO4	Apply analytical skills and problem-solving tools/techniques to the fault analysis of various machines and equipment	2	2	1	2	2				1	2	3

Course	Code	Sem	Cr			CO	Course Outcome											
Total Quality Management	MMEE2-312	3rd	4	60	4 0 0	CO1	Understand the fundamental principles of Total Quality Management and its tools.	2	-	3	2	2	2	-	2	1	2	2
						CO2	Apply appropriate statistical techniques for improving processes in terms of quality.	2	2	3	2	2	2	1	1	1	3	3
						CO3	An understanding of the impact of workforce on quality management.	2	1	1	3	2	-	2	2	-	-	2
						CO4	Ability to use knowledge to solve quality related problems.	1	2	2	2	2	-	-	1	-	2	3
PROJECT & SEMINAR	MMEE2-313	3rd	4	60	0 0 4	CO1	Undertake problem identification, formulation and solution.	2	1	1	1	1	1	1	1	3	3	3
						CO2	Design engineering solutions to complex problems utilising a systems approach.	2	1	1	2	1	1	2	1	3	3	3
						CO3	Communicate with engineers and the community at large in written and oral form.	1	1	1	2	1	1	3	1	2	3	2
						CO4	Demonstrate the knowledge, skills and attitudes of a professional Engineer.	1	1	1	2	1	2	2	1	2	3	3
Final Thesis	MMEE2- 415	4th	20	---	0 0 0	CO1	Demonstrate a depth of knowledge of Mechanical Engineering	2	3	3	-	1	3	2	2	3	2	2
						CO2	Complete an independent research project, resulting in at least a research outputs in terms of publications in high impact factor journals, conference proceedings, and patents.	1	2	2	-	1	3	2	1	-	3	2

						CO3	Demonstrate knowledge of contemporary issues in their chosen field of research.	2	2	3	-	-	2	-	2	1	2	2
						CO4	Demonstrate an ability to present and defend their research work to the panel of experts.	2	3	2	-	1	3	3	-	-	3	2