Mapping of Course Outcomes(COs) with Program Outcomes (POs)

Program Core (PC)		
No.	**Course with code**	**Outcomes**
01	MF 700 – Metal Removal Processes	1. Develop utilization of understanding of fundamentals of the traditional cutting tools compare it with other tools (a) 2. Identify and utilize fundamentals of metal cutting as applied to the machining. (c) 3. Be able to identify a problem and apply the fundamental concepts and enable to solve problems arising in metal removal process. (b) 4. Demonstrate the ability to define and formulate the properties of cutting tool materials and characteristics (a) 5. Develop the skills of effective utilization of the cutting fluids and applications for better productivity (l) 6. Become competent to design and analyze problems of engineering particularly having relevance to manufacturing (d) 7. The students will demonstrate the comparison between non-traditional machining processes with the traditional parameters- Energy sources; Economics of the processes; Shape and size of material etc. (f, g) 8. Demonstrate ability to arrive at cutting parameters for machining. (b) 9. Develop methods of working for minimizing the production cost. (l)
02	MF 701 – Computer Integrated Manufacturing	1. To explain the nature and role of the elements of CIM system. (a, e, f) 2. To discuss the stages in the product development cycle through CIM and the importance of each stage. (c, e, l) 3. To construct and organize database in CIM applications. (b, e) 4. To analyze and design material handling and storage systems. (b) 5. To program and operate a PLC system. (b, d) 6. To present the principles of Numerical Control (NC). (j, c)
03	MF 702 – Product design and rapid prototyping	1. To describe an engineering design and development process. (a, b, c, d) 2. Describe, compare and to apply various support methods in the product development (b, d) 3. To employ engineering, scientific, and mathematical principles to execute a design from concept to finished. (a, d, g, h, l) 4. To work collaboratively on a team to successfully

		complete a design project. (g, i, l) 5. To effectively communicate the results of projects in a written and oral format. ((b, i, j) 6. Reflect on the ethical aspects of product development. (h) 7. To have the knowledge of rapid prototyping and its various techniques involved. (a, c)
04	MF 703 – Robotics	1. To describe and analyze rigid motion. (d) 2. To formulate manipulator kinematics and operate with the resulting equations. (b) 3. To solve simple inverse kinematics problems (a, d) 4. To select sensors for performing robotic tasks. (b, d) 5. To solve motion planning problems. (a, d) 6. To operate/ program / repair industrial robots. (a, b, d, i, e) 7. To describe current status of robotics technology and new development. (f)
05	MF 704 – Manufacturing Systems Lab I	1. To apply the knowledge of computer graphics , database structure in configuring CAD related software applications. (a, d) 2. To implement methods of utilization of appropriate features in CAD application thereby enhancing product. (b, g, e) 3. To create CAD models related to mechanical assembly thereby reducing the lead time. (b, e, f, k, l) 4. To selectively choose the appropriate CAD modeling techniques for various industrial applications. (b, c, e) 5. To understand the critical links and advantages of using parametric modeling in creation of a product structure. (a, b, d) 6. To demonstrate effective communication of advanced design specifications through application of geometric modeling. (j)
06	MF 705 – Metrology and Instrumentation	1. To understand and respond to the need for rigorous and formal metrology concepts in designing (a, b) 2. To recognize the limits on data imposed by measurement and analyze uncertainty in an appropriate manner. (b, d) 3. To use basic statistical methods to aid data evaluation and decision making. (b, i) 4. To appreciate how to identify and specify sensors (or complete instruments) for controlling machines and production. (b, d) 5. To understand the operating principles of a range of widely used instrumentation techniques and appreciate systems. (a, b, d)
		1. To classify the mechanism of Mechanical machining

07	MF 706 – Modern Machining Processes	processes, economic considerations in Ultrasonic machining. (a, c, f) 2. To interpret Electro Chemical machining process, economic aspects of ECM and problems on estimation. (b, d) 3. To relate Generation and control of electron beam for machining, laser beam machining and comparison. (a, c, d) 4. To differentiate Thermal Metal Removal Processes, characteristics of spark eroded surface, machine tool selection. (b, c, d)
08	MF 707 - Manufacturing Systems Lab II	1. To understand, interpret and execute CNC part programming. (a, b, d) 2. To get acquainted with knowledge of tool path generation. (a, b, d) 3. To learn application of advanced skills in CAM. (e) 4. To gain insight into structural analysis using FEA software. (b, d, e)
Elective Courses		
01	ME 800 – Finite Element Method	1. To construct accurate finite element models of various components loading scenarios, and processes. (a, b, d, e) 2. To develop appropriate engineering assumptions and their finite element implementation to allow component analysis. (a, d) 3. To refine and adapt the finite element mesh, boundary conditions, and all relevant loads for a given thermal boundary conditions. (d, e, i) 4. To demonstrate an ability to extend finite element modeling to include non-traditional problems encounter dependent and non-linear problems. (a, d, e) 5. To demonstrate the ability to use existing analytical and approximate methods to verify their finite element model. (b, c, d, e) 6. To clearly and effectively communicate their modeling efforts and results in written form. (j) 7. To critically analyze their assumptions, methods, and results. (b)
02	ME 803 – Theory of Metal forming Processes	1. To identify the unique characteristics of metals that lead to plastic deformation as a processing strategy. (a, c, g) 2. To explain the processes involved in metal forming mechanics, materials, and tribology. (a, c, d) 3. To analyze the interrelationships between various factors that influence the quality of manufactured product. (f, g, h) 4. To describe sheet metal characteristics and forming (a) 5. To describe the wide variety of processes used to shape

		and deform metals, including forging, rolling and e powder metallurgy processes and assorted other processes. (a, c, f)
03	ME 802 – Technology of Composite Materials	1. To understand the fundamental differences between alloys and composites from 'strengthening concept'. (a, b) 2. To identify the properties of fiber and matrix materials used in commercial composites. (b, d) 3. To predict the elastic properties of both long and short fiber composites based on the constituent properties. (b, d) 4. To rotate stress, strain and stiffness tensors using ideas from matrix algebra. (d, f) 5. To assimilate knowledge of issues in fracture of composites and environmental degradation of composites. (f, g, h) 6. To have exposure to recent developments in composites, including metal and ceramic matrix composites (f, k)
04	ME 807 – Machine Tool Dynamics	1. To design and analyze kinematic motions in a machine tool. (b, c) 2. To understand integrated overview about dynamic properties and characteristics of various machine tools (b, d) 3. To design and analyze systems used for achieving required speeds and feeds. (b, c, d) 4. To select slide ways, spindles and lead screws for reducing friction and achieving high product accuracy. (b, c, d) 5. To explain the reasons for chatter in machining and analyze vibrations so as to improve the machine tool performance. (d) 7. To understand the spectral and modal properties of machines which are crucial for stable and failure-free machining. (a, b)
05	ME 817 – Fracture Mechanics	1. To gain an understanding and appreciation of the breadth and depth of the field of fracture mechanics. (a) 2. To recognize the strong relationship of fracture mechanics as design tools. (d, f) 3. To become familiar with some of the basic fracture mechanics, fracture criterions, stress and displacements. (d, f) 4. To learn and apply the basic terminology associated with these fields. (f) 5. To increase your knowledge and broaden the perspective of the fracture mechanics world. (b,d) 6. To emphasize for the selection of materials for the required applications. (b, d)
	ME806 - Surface	1. Learn to select the suitable surface engineering process

06	Treatment and Finishing	for the particular material and application. (b, c, d) 2. Gains the knowledge of science and engineering of platting Processes, Diffusion Processes, Thermal spray coatings. (a, c, d) 3. Gains knowledge about advanced characterization techniques and testing of thin films and coatings. (a, c) 4. To learn about High-energy Surface Modifications, Hard Facing Processes and Plasma Surface Engineering (a, b, c) 5. Ability to choose heat treatment conditions for superalloys, Tool steels, Titanium alloys and cast iron. (a, b, c)