

**G. S. Mandal's**  
**Maharashtra Institute of Technology (An Autonomous Institute)**  
**Aurangabad**  
**Department of Mechanical Engineering**  
**Third Year Mechanical (Autonomous)**

**Course Outcomes**

<b>HSMC HSM301: Engineering Economics, Finance &amp; Costing</b>		
<b>CO No.</b>	<b>Code</b>	<b>Statement</b>
CO 1	HSM 301.1	Define and explain economics, costing and financial concepts.
CO 2	HSM 301.2	Calculate present value, future value of single cash flow and annuities using appropriate formulas.
CO 3	HSM 301.3	Conduct cost estimation, including materials, labor, overhead, and other related costs
CO 4	HSM 301.4	Identify sources of risk and uncertainty in engineering projects
CO 5	HSM 301.5	Compare different economic evaluation methods (e.g., net present value, internal rate of return, payback period) to assess project feasibility.
CO 6	HSM 301.6	Evaluate investment proposals for personal financial management.

**Mapping of Course Outcomes with Program Outcomes**

<b>CO No.</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO 1</b>	3	1	-	-	-	-	-	-	-	-	-	-
<b>CO 2</b>	2	3	-	-	-	-	-	-	-	-	-	-
<b>CO 3</b>	3	-	3	-	-	-	-	-	-	-	-	-
<b>CO 4</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 5</b>	-	-	3	-	-	-	-	-	-	-	-	-
<b>CO 6</b>	-	3	-	-	-	-	-	-	-	-	-	-
<b>Avg.</b>	2.75	2.33	3	-	-	-	-	-	-	-	-	-

**Mapping of Course Outcomes with Program Specific Outcomes**

<b>CO No.</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
<b>CO 1</b>	-	-	-
<b>CO 2</b>	-	-	3
<b>CO 3</b>	-	-	2
<b>CO 4</b>	-	-	1
<b>CO 5</b>	-	-	1
<b>CO 6</b>	-	-	-
<b>Avg.</b>	-	-	1.75

**Course Outcomes**

<b>MED 302: Design of Machine Elements – I</b>		
<b>CO No.</b>	<b>Code</b>	<b>Statement</b>
CO 1	MED 302.1	Define the fundamentals of machine elements, mechanical joints and its components
CO 2	MED 302.2	Find the design parameters against static and fluctuating loads.
CO 3	MED 302.3	Explain the theory of mechanical joints and its components.
CO 4	MED 302.4	Illustrate the theory of power screw, spring, failures and fluctuating loads.
CO 5	MED 302.5	Design the mechanical joints, power screws and springs.
CO 6	MED 302.6	Analyze the designed the mechanical joints, power screws and springs.

**Mapping of Course Outcomes with Program Outcomes**

<b>CO No.</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO 1</b>	3	-	-	-	-	-	-	-	-	-	-	3
<b>CO 2</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 3</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 4</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 5</b>	3	3	3	-	-	-	-	-	-	-	-	-
<b>CO 6</b>	3	3	3	-	-	-	-	-	-	-	-	-
<b>Avg.</b>	3	3	3	-	-	-	-	-	-	-	-	3

**Mapping of Course Outcomes with Program Specific Outcomes**

<b>CO No.</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
<b>CO 1</b>	3	-	-
<b>CO 2</b>	3	-	-
<b>CO 3</b>	3	-	-
<b>CO 4</b>	3	-	-
<b>CO 5</b>	3	-	-
<b>CO 6</b>	3	-	-
<b>Avg.</b>	3	-	-

### Course Outcomes

<b>MED 303: Materials and Metallurgy</b>		
<b>CO No.</b>	<b>Code</b>	<b>Statement</b>
CO 1	MED 303.1	Remember the types of materials, mechanical properties and crystal structures of materials
CO 2	MED 303.2	Understand the different types of phase diagrams and equilibrium diagrams
CO 3	MED 303.3	Describe the microstructures of different types of Metals and Alloys
CO 4	MED 303.4	Distinguish between the properties and applications of different types of Metals and Alloys
CO 5	MED 303.5	Illustrate between various types of heat treatment processes and their effects on steel structure and properties
CO 6	MED 303.6	Discuss about super alloys, shape memory alloys and composites

### Mapping of Course Outcomes with Program Outcomes

<b>CO No.</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO 1</b>	3	1	-	-	-	-	-	-	-	-	-	1
<b>CO 2</b>	2	1	1	-	-	-	-	-	-	-	-	-
<b>CO 3</b>	3	2	-	-	-	-	-	-	-	-	-	1
<b>CO 4</b>	3	-	-	-	-	-	-	-	-	-	-	1
<b>CO 5</b>	1	3	1	-	1	-	-	-	-	-	-	2
<b>CO 6</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>Avg.</b>	2.5		1	-	1	-	-	-	-	-	-	1.25

### Mapping of Course Outcomes with Program Specific Outcomes

<b>CO No.</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
<b>CO 1</b>	1	-	1
<b>CO 2</b>	1	-	1
<b>CO 3</b>	-	-	2
<b>CO 4</b>	-	-	2
<b>CO 5</b>	-	2	2
<b>CO 6</b>	-	-	-
<b>Avg.</b>	1	2	1.6

### Course Outcomes

<b>MED 304: CAD/CAM/CAE</b>		
<b>CO No.</b>	<b>Code</b>	<b>Statement</b>
CO 1	MED 304.1	Define CAD, CAM, CAE, Rapid prototyping and Robot.
CO 2	MED 304.2	Select the geometric modeling techniques.
CO 3	MED 304.3	Demonstrate computer aided engineering.
CO 4	MED 304.4	Outline the concepts of group technology and flexible manufacturing systems.
CO 5	MED 304.5	Solve numerical on geometric transformations & basic element analysis.
CO 6	MED 304.6	Develop CNC manual part program.

### Mapping of Course Outcomes with Program Outcomes

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO 1</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 2</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 3</b>	1	3	-	-	-	-	-	-	-	-	-	-
<b>CO 4</b>	1	-	-	-	-	-	-	-	-	-	-	-
<b>CO 5</b>	1	-	-	-	-	-	-	-	-	-	-	-
<b>CO 6</b>	3	1	-	-	-	-	-	-	-	-	-	-
<b>Avg.</b>	2	2	-	-	-	-	-	-	-	-	-	-

### Mapping of Course Outcomes with Program Specific Outcomes

CO No.	PSO 1	PSO 2	PSO 3
<b>CO 1</b>	-	-	-
<b>CO 2</b>	1	-	-
<b>CO 3</b>	1	-	-
<b>CO 4</b>	-	-	-
<b>CO 5</b>	-	1	-
<b>CO 6</b>	-	-	1
<b>Avg.</b>	1	1	1

### Course Outcomes

<b>MED 305: Internal Combustion Engines</b>		
<b>CO No.</b>	<b>Code</b>	<b>Statement</b>
CO 1	MED 305.1	Recall IC engine terminology and different systems of IC engines
CO 2	MED 305.2	Understand the various losses, stages of combustion and performance parameter in IC engines.
CO 3	MED 305.3	Apply knowledge of fundamentals of thermodynamics and physics to measure performance parameters and characteristics of IC engines
CO 4	MED 305.4	Compare different technologies to enhance IC engine performance
CO 5	MED 305.5	Assess the effect of engine emission on environment and control of emission by exhaust gas treatment.
CO 6	MED 305.6	Discuss the recent technology to overcome the fossil fuel problems and to enhance performance of Traditional engines.

### Mapping of Course Outcomes with Program Outcomes

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO 1</b>	3	-	-	-	-	1	1	-	-	-	-	-
<b>CO 2</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 3</b>	3	-	1	2	-	-	-	-	-	-	-	-
<b>CO 4</b>	3	-	1	-	-	-	-	-	-	-	-	-
<b>CO 5</b>	3	-	-	-	-	3	3	-	-	-	-	1
<b>CO 6</b>	3	-	-	-	-	-	-	-	-	-	-	2
<b>Avg.</b>	3	-	1	2	-	2	2	-	-	-	-	1.5

### Mapping of Course Outcomes with Program Specific Outcomes

CO No.	PSO 1	PSO 2	PSO 3
<b>CO 1</b>	-	3	-
<b>CO 2</b>	-	3	-
<b>CO 3</b>	2	3	-
<b>CO 4</b>	-	3	-
<b>CO 5</b>	-	3	-
<b>CO 6</b>	-	3	-
<b>Avg.</b>	2	3	-

### Course Outcomes

<b>MED 351: Design of Machine Elements – II</b>		
<b>CO No.</b>	<b>Code</b>	<b>Statement</b>
CO 1	MED 351.1	Define the basic terms involved in mechanical power transmission drives.
CO 2	MED 351.2	Explain the various types of mechanical power transmission drives and their classifications.
CO 3	MED 351.3	Illustrate the applications of different mechanical power transmission drives.
CO 4	MED 351.4	Estimate the design procedure for mechanical power transmission drive & its components.
CO 5	MED 351.5	Design of mechanical power transmission drives.
CO 6	MED 351.6	Select and design appropriate bearing for mechanical power transmission systems.

### Mapping of Course Outcomes with Program Outcomes

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO 1</b>	3	-	-	-	-	-	-	-	-	-	-	3
<b>CO 2</b>	3	-	-	-	-	-	-	-	-	-	-	3
<b>CO 3</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 4</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 5</b>	3	3	3	-	-	-	-	-	-	-	-	-
<b>CO 6</b>	3	3	3	-	-	-	-	-	-	-	-	-
<b>Avg.</b>	3	3	3	-	-	-	-	-	-	-	-	-

### Mapping of Course Outcomes with Program Specific Outcomes

CO No.	PSO 1	PSO 2	PSO 3
<b>CO 1</b>	3	-	-
<b>CO 2</b>	3	-	-
<b>CO 3</b>	3	-	-
<b>CO 4</b>	3	-	-
<b>CO 5</b>	3	-	-
<b>CO 6</b>	3	-	-
<b>Avg.</b>	3	-	-

**Course Outcomes**

<b>MED 352: Theory of Machines</b>		
<b>CO No.</b>	<b>Code</b>	<b>Statement</b>
CO 1	MED 352.1	Understand the principles of kinematic pairs, chains and their classification, degree of freedom, inversions and other mechanisms.
CO 2	MED 352.2	Analyse the planar mechanisms for the position, velocity and acceleration.
CO 3	MED 352.3	Synthesise planar 4 bar and slider crank mechanism for specified kinematic conditions.
CO 4	MED 352.4	Design Cam and followers for specified motion profiles.
CO 5	MED 352.5	Understand the working principle of flywheel, governor, brakes and dynamometer.
CO 6	MED 352.6	Determine the unbalanced forces in various types of rotating and reciprocating masses and engines.

**Mapping of Course Outcomes with Program Outcomes**

<b>CO No.</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO 1</b>	3	3	-	-	3	-	-	-	-	-	-	-
<b>CO 2</b>	3	3	-	3	-	-	-	-	-	-	-	-
<b>CO 3</b>	3	-	-	3	-	-	-	-	-	-	-	-
<b>CO 4</b>	3	2	3	3	-	-	-	-	-	-	-	-
<b>CO 5</b>	3	3	-	2	-	-	-	-	-	-	-	-
<b>CO 6</b>	3	3	-	3	-	-	-	-	-	-	-	-
<b>Avg.</b>	3	2.8	3	2.8	3	-	-	-	-	-	-	-

**Mapping of Course Outcomes with Program Specific Outcomes**

<b>CO No.</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
<b>CO 1</b>	-	-	-
<b>CO 2</b>	3	-	-
<b>CO 3</b>	3	-	-
<b>CO 4</b>	3	-	-
<b>CO 5</b>	-	-	-
<b>CO 6</b>	-	-	-
<b>Avg.</b>	3	-	-

**Course Outcomes**

<b>MED 353: Heat Transfer</b>		
<b>CO No.</b>	<b>Code</b>	<b>Statement</b>
CO 1	MED 353.1	Recall the basic concepts of thermodynamics and heat transfer
CO 2	MED 353.2	Interpret heat transfer applications in different modes and configurations, such as steady-state and transient conditions.
CO 3	MED 353.3	Apply mathematical models and equations for analyzing and solving heat transfer problems.
CO 4	MED 353.4	Choose empirical correlations for convection, and phase change process to determine values for the heat transfer coefficient.
CO 5	MED 353.5	Develop skills in experimental techniques for measuring heat transfer coefficients and temperatures.
CO 6	MED 353.6	Evaluate the temperature profiles and performance of fins and heat exchangers.

**Mapping of Course Outcomes with Program Outcomes**

<b>CO No.</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO 1</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 2</b>	3	1	-	-	-	-	-	-	-	-	-	-
<b>CO 3</b>	3	3	-	-	-	-	-	-	-	-	-	-
<b>CO 4</b>	3	2	-	-	-	-	-	-	-	-	-	-
<b>CO 5</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 6</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>Avg.</b>	3	2	-	-	-	-	-	-	-	-	-	-

**Mapping of Course Outcomes with Program Specific Outcomes**

<b>CO No.</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
<b>CO 1</b>	-	2	-
<b>CO 2</b>	-	3	-
<b>CO 3</b>	-	2	-
<b>CO 4</b>	-	2	-
<b>CO 5</b>	-	1	-
<b>CO 6</b>	-	2	-
<b>Avg.</b>	-	2	-



**Course Outcomes**

<b>MED 354: Mechatronics</b>		
<b>CO No.</b>	<b>Code</b>	<b>Statement</b>
CO 1	MED 354.1	Demonstrate the basics of mechatronics systems and its components.
CO 2	MED 354.2	Classify the types of sensors like analog, digital, touch and proximity sensors and their usage.
CO 3	MED 354.3	Outline working and usage of various types of actuators and pneumatic systems.
CO 4	MED 354.4	Identify working construction and applications of PLC in industry.
CO 5	MED 354.5	Determine the selection criteria of sensors, actuators and PLC's for case study of simple mechatronics systems.
CO 6	MED 354.6	Tell relationship between PLC controllers and supervisory control systems.

**Mapping of Course Outcomes with Program Outcomes**

<b>CO No.</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO 1</b>	2	1	2	-	-	-	-	-	-	-	-	-
<b>CO 2</b>	3	1	2	-	-	-	-	-	-	-	-	-
<b>CO 3</b>	1	-	3	-	-	-	-	-	-	-	-	-
<b>CO 4</b>	-	-	3	-	-	-	-	-	-	-	-	-
<b>CO 5</b>	-	2	3	-	-	-	-	-	-	-	-	-
<b>CO 6</b>	-	-	3	-	-	-	-	-	-	-	-	-
<b>Avg.</b>	2	1.33	2.66	-	-	-	-	-	-	-	-	-

**Mapping of Course Outcomes with Program Specific Outcomes**

<b>CO No.</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
<b>CO 1</b>	-	-	3
<b>CO 2</b>	-	-	3
<b>CO 3</b>	-	-	3
<b>CO 4</b>	-	-	3
<b>CO 5</b>	-	-	3
<b>CO 6</b>	-	-	3
<b>Avg.</b>	-	-	3

### Course Outcomes

<b>Open Elective-III MED 391: Industry 4.0</b>		
<b>CO No.</b>	<b>Code</b>	<b>Statement</b>
CO 1	MED 391.1	Demonstrate concept and basic structure of Industry 4.0.
CO 2	MED 391.2	Able to determine link between Mechatronics and Industry 4.0.
CO 3	MED 391.3	Classify various technologies under the roof of Industry 4.0, like IoT, cyber physical system etc.
CO 4	MED 391.4	Identify role of data and related terms like big data, data analytics etc. in the Industry 4.0.
CO 5	MED 391.5	List out various applications of fourth industrial revolution in different sectors of Industries.
CO 6	MED 391.6	Identify challenges with Industry 4.0 and future opportunities.

### Mapping of Course Outcomes with Program Outcomes

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>CO 1</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 2</b>	2	1	-	2	2	-	-	-	-	-	-	-
<b>CO 3</b>	1	2	-	1	3	-	-	-	-	-	-	-
<b>CO 4</b>	-	1	2	-	3	-	-	-	-	-	-	-
<b>CO 5</b>	-			1	3	-	-	-	-	-	-	-
<b>CO 6</b>	-	2	2	-	3	-	-	-	-	-	-	-
<b>Avg.</b>	-	-	-	-	-	-	-	-	-	-	-	-

### Mapping of Course Outcomes with Program Specific Outcomes

CO No.	PSO 1	PSO 2	PSO 3
<b>CO 1</b>	-	-	3
<b>CO 2</b>	-	-	2
<b>CO 3</b>	-	-	2
<b>CO 4</b>	-	-	1
<b>CO 5</b>	-	-	2
<b>CO 6</b>	-	-	3
<b>Avg.</b>	-	-	2.16

**Course Outcomes**

<b>Open Elective-III MED 392: Operation Research</b>		
<b>CO No.</b>	<b>Code</b>	<b>Statement</b>
CO 1	MED 392.1	Outline the various types of decision-making environment and appropriate decision-making approaches
CO 2	MED 392.2	Build operational research model from verbal description of the system
CO 3	MED 392.3	Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.
CO 4	MED 392.4	Determine the optimal solution for transportation, assignment, Queuing and sequencing problems.
CO 5	MED 392.5	Formulate Network models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these Network problems
CO 6	MED 392.6	Use computer software's to solve decision models.

**Mapping of Course Outcomes with Program Outcomes**

<b>CO No.</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO 1</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 2</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 3</b>	3	-	-	-	-	-	-	-	-	-	-	-
<b>CO 4</b>	3	-	2	-	-	-	-	-	-	-	-	-
<b>CO 5</b>	-	-	-	-	-	-	-	-	-	-	3	-
<b>CO 6</b>	-	-	-	-	3	-	-	-	-	-	-	-
<b>Avg.</b>	3	-	2	-	3	-	-	-	-	-	3	-

**Mapping of Course Outcomes with Program Specific Outcomes**

<b>CO No.</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>
<b>CO 1</b>	-	-	2
<b>CO 2</b>	-	-	2
<b>CO 3</b>	-	-	2
<b>CO 4</b>	-	-	3
<b>CO 5</b>	-	-	3
<b>CO 6</b>	-	-	3
<b>Avg.</b>	-	-	2.5