



**National Institute of Technology Meghalaya**  
An Institute of National Importance

**CURRICULUM**

Programme	<b>Bachelor of Technology in Mechanical Engineering</b>	Year of Regulation	<b>2018</b>
Department	<b>Mechanical Engineering</b>	Semester	<b>V</b>

Course Code	Course Name	Credit Structure				Marks Distribution				
		L	T	P	C	INT	MID	END	Total	
<b>ME 305</b>	<b>Machine Design-I</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>50</b>	<b>50</b>	<b>100</b>	<b>200</b>	
Course Objectives	To introduce design of machine elements	Course Outcomes	CO1	Demonstrate the basic knowledge of design methodologies, different considerations (aesthetic, ergonomic, manufacturing, safety etc.) and materials (Understanding)						
	To teach the different failure theories		CO2	Demonstrate knowledge on basic machine elements (Understanding)						
	To develop an ability and skill to design against static and dynamic load		CO3	Solve problems related to machine elements which withstand the loads and deformations (static and fluctuating), while considering constraints (Applying)						
	To develop an ability and skill to design various machine elements like spring, belt, chain, shafts and different joints like threaded, riveted, welded joints		CO4	Analyze and quantify failure modes of mechanical parts applying different types of stress and strain analysis (Analyzing)						
			CO5	Evaluate a design problem successfully, taking decisions when there is no unique answer (Evaluate)						

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	2	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
2	CO2	3	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
3	CO3	3	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
4	CO4	0	0	3	0	0	0	0	0	0	0	0	0	0	3	1	0
5	CO5	0	0	3	0	0	0	0	0	0	0	0	0	0	3	1	0
6	CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

**SYLLABUS**

No.	Content	Hours	COs
I	<b>Introduction</b> Engineering Design Process, Factors influencing Design, Engineering Materials, Manufacturing Considerations in Design – Limits, Fits and Tolerances	<b>03</b>	<b>CO1</b>
II	<b>Design against Static Loading</b> Stress Strains Relationship, Theories of Failure, Stress Concentration Factor, Concept of Factor of Safety	<b>05</b>	<b>CO2</b> <b>CO3</b> <b>CO4</b>
III	<b>Design against Fatigue Loading</b> Variable load - basic concept; load or stress variations- Cyclic stresses/strains - materials response and the origin of fatigue failure. Stress life relations; Factors influencing fatigue and endurance strength - Effect of stress concentration and fatigue stress concentration. Design approach to fatigue, design of members under combined loading conditions.	<b>05</b>	<b>CO2</b> <b>CO3</b> <b>CO4</b>
IV	<b>Design of Shafts, Keys and Couplings</b> Design of transmission shafts subjected to bending, twisting and combined bending twisting and axial loading for strength and rigidity. Design against fatigue loading. Design of Keys. Design of Couplings – Rigid and Flexible.	<b>05</b>	<b>CO2</b> <b>CO3</b> <b>CO4</b> <b>CO5</b>
V	<b>Design of Spring</b> Mechanical Springs, Spring Materials, Design of Helical Springs against static and fluctuating loads. Design of Leaf Springs.	<b>04</b>	<b>CO2</b> <b>CO4</b>
VI	<b>Design of Belts and Chains</b> Flat and V-belt, Construction, Analysis of Belt tensions, Selection of Flat and V-belts. Chain drives.	<b>04</b>	<b>CO2</b> <b>CO4</b>
VII	<b>Design of Joints</b> Threaded Joints – types of screw threads. Design of Bolted Joints under static and fluctuating load. Eccentrically loaded bolted joints. Welded Joints -- type of welded joints, welding symbol and weld symbol and their representation, strength of welded joints subjected to static and fluctuating loads. Eccentrically loaded welded joints. Riveted joints – types of joints, design of riveted joints for structure. Design of Cotter and Knuckle joint.	<b>10</b>	<b>CO2</b> <b>CO3</b> <b>CO4</b> <b>CO5</b>
<b>Total Hours</b>		<b>36</b>	

**Essential Readings**

1. J. E. Shigley, "Mechanical Engineering Design", McGraw Hill.
2. V B Bhandari, "Design of Machine Elements", Tata McGraw Hill.

**Supplementary Readings**

1. A. H. Burr and J. B. Cheatham, "Mechanical Analysis and Design", Prentice Hall.
2. M.F Spotts, T.E Shoup, L.E. Hornberger, S.R Jayram, and C. V. Venkatesh, "Design of Machine Elements", Person Education.
3. Faculty of Mechanical Engineering, PSG College of Technology, "Design Data Book".