

ME554: Machine Tool Design

Teaching Scheme			Credits	Marks Distribution				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE	CE	ESE	CE		
3	0	2	5	70	30	30	20	150

Course Content:

Sr. No.	Topics	Teaching Hrs.
1	<p><u>Introduction to Machine Tool Drives:</u></p> <p>Types and capabilities of machine tools, Constructional and operational features, General Requirements of Machine Tool Design, Working and Auxiliary Motions in Machine Tools, Kinematics of Machine Tools, Motion Transmission, mechanical, hydraulic and electric drives.</p>	03
2	<p><u>Regulation of Speed and Feed Rates:</u></p> <p>Aim of Speed and Feed Regulation, Layout of Speed Change Gears, Saw Diagrams for Arithmetic, Geometric, Harmonic and Logarithmic Progression of spindle speeds. Establishment of Gear Ratios, Layout of the Intermediate Reduction Gears, Calculation of Transmission Ratios, Pulley Diameter, Gear Wheel Diameters and Number of Teeth. Ray Diagram. Speed Chart., Design of Speed Gear Boxes, Feed Drives, Feed Box Design.</p>	10
3	<p><u>Design of Machine Tool Structures:</u></p> <p>Functions of Machine Tool Structures and Their Requirements, Design criteria for Machine Tool Structures, Materials of Machine Tool Structures, Static and Dynamic Stiffness, Profiles of Machine Tool Structures, Basic Design</p> <p>Procedure of Machine Tool Structures, Design of Beds, Columns, saddles, carriages, Bases and Tables.</p>	06
4	<p><u>Design of Guideways and Power Screws :</u></p> <p>Functions and Types of Guide ways, Design of Slide ways, clearance adjustment in slideways. Design of Anti-Friction Guide ways, Combination Guide ways and Aerostatic guideways. Design of Power Screws and Recirculating ball screws.</p>	06

5	<u>Design of Spindles and Spindle Supports:</u>	05
	Functions of Spindles and Requirements, Effect of Machine Tool Compliance on Machining Accuracy, Design of Spindles, Antifriction Bearings.	
6	<u>Dynamics of Machine Tools:</u>	05
	Machine Tool Elastic System, Static and Dynamic Stiffness, Effects of vibration, stability analysis. Methods to reduce instability in machine tool like dampers, vibration absorbers etc, Machine Tool Chatter.	
7	<u>Control Systems in Machine Tools:</u>	04
	Machine tool control systems, Control Systems for Speed and Feed Changing, Adaptive Control Systems,	
8	Ergonomics and aesthetic design of machine tool, Recent trends of machine tool.	03

Total Hrs.	42
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Reference Books:

1. N K Mehta, "*Machine Tool Design and Numerical Control*", McGraw-Hill.
2. CMTI, "*Machine Tool Design Handbook*", McGraw-Hill
3. S.K. Basu, "*Machine Tool Design*", Oxford and IBH Publishing.
4. Sen and Bhattacharya, "*Machine Tool Design*" CBS Publications.