

4ME54: MACHINE TOOL DESIGN
CREDITS - 4 (LTP: 3, 0, 1)

Course Objective:

To select and design drives and various components of machine tools

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE	CE	ESE	CE	150	
3	0	2	4	60	40	20		30

Course Contents:

Unit No.	Topics	Teaching Hours
1	General Principle of machine tool design: Introduction to machine tool, General requirements of machine tool design, Specifications and layout of machine tools, Machining range diagram, Interference diagram, Parameter defining working motions of a machine tool. Working and auxiliary motion in machine, Machine tool drives, Hydraulic transmission, Mechanical transmission, mechanical, hydraulic and electric drives. Ergonomics and aesthetic aspects of machine tool design.	07
2	Regulation of Speed and Feed: Speed regulation using step cone pulley, Design of speed and feed boxes, step less speed and feed regulations.	06
3	Design of Machine Tool Structures: Fundamentals of machine tool structures and their requirements, Design criteria of machine tool structure, Materials for machine tool structure, Structure profiles, Design of beds and columns, Design of housing models, bases and tables, Design of saddle, carriages and rams. Timing gears	07
4	Design of Guideways and Power Screws: Function and type of guide-ways, design of slide-ways, Protecting devices for slide-ways, Selection of power screws.	07
5	Design of Spindles and Selection of Spindle Supports: Materials for spindles, Design principles of spindles, Antifriction bearings, Sliding bearings.	08
6	Recent developments in machine tools: Hexapod mechanism, Design features: Hexapods of Telescopic Struts and Hexapods of Ball Screw Struts, hexapods constructional features, characteristics and application, CNC machine tool controls.	07
Total		42

List of References:

1. N.K. Mehta, "*Machine Tool Design*", Tata McGraw Hill.
2. F. Koenigsberger, "*Design Principles of Metal Cutting Machine tool*", Pergamon press
3. "*Machine Tool design Handbook*", CMTI Bangalore, McGraw-Hill
4. Sen and Bhattacharya, "*Machine Tool Design*", CBS Publications.
5. Boothroyd, G., "*Fundamentals of Metal Machining and Machine Tools*", McGraw hill.
6. Acherkan, "*Machine Tool Design, Vol 2 & 3*", MIR Pub, Russia. 7. Machine Tool Design
7. Helmi A Youssef, "*Machining Technology: Machine tools and operations*", CRC Press

Course Outcomes (COs):

At the end of this course students will be able to ...

1. Identify appropriate drives for generating a given motion in machine tools
2. Design speed and feed drives.
3. Design machine tool structure.
4. Design guide ways and select power screws.
5. Design spindle and select its supports.
6. Outline recent developments in machine tools.