

PCMF4403 MACHINE TOOL DESIGN

(3-0-0)

MODULE-I

(14 hours)

Introduction: Developments in machine tools, classification of machine tools, General requirement of machine tool design. Machine tool design process. A brief review of the elements of mechanical transmission e.g. gear, belt and chain drives, slider-crank mechanism, cam mechanism, nut & Screw transmission, Devices for intermittent motion, reversing & differential mechanisms. Couplings and clutches Elements of hydraulic transmission system. e.g. pumps, cylinder, directional control valves, pressure valves etc.

Module-II

(11 hours)

Kinematics of machine tools:

Types of drives, selection and design requirements, regulation of Speed and Feed rates: Laws of stepped regulation, selection of range ratio, standard progression ratio, selection of best possible structural diagram, speed chart, Design of feed box, Developing gearing diagrams. Stepless regulation of speed and feed in machine tool, speed and feed control.

Design of Machine Tool Structure: Requirements and design criteria for machine tool structures, selection of material Basic design procedure for machine tool structures, design of bed, table, column and housing, Model technique in design. Design of guideways and power screws: Basic guideway profiles, Designing guideway for stiffness a wear resistance & hydrostatic and antifriction guideways. Design of sliding friction power Screws. Design of spindler & spindle supports. Layout of bearings, selection of bearings machine tools

Module-III

(10 hours)

Dynamics of machine tools: General procedure for assessing the dynamic stability of cutting process, closed loop system, chatter in machine tools. Control Systems: Functions, requirements & types of machine tool controls, controls for speed & feed change. Automatic and manual Controls. Basics of numerical controls. Sources, effects and elimination of vibration and chatter, ergonomic considerations applied to the design of control members.

TEXT BOOKS

1. Machine Tools Design & Numerical Controls –N.K. Mehta, T.M.H. New Delhi.
2. Design of Machine Tools – S.K. Basu Allied Publishers.
3. Principles of Machine Tools, Bhattacharya A and Sen.G.C. New Central Book Agency.