

MEV303: Machining Science and Machine Tools

Prerequisite: Nil

Module 1 (10 hours)

Kinematic elements in metal cutting. Tool nomenclatures. Mechanics of chip formation, orthogonal and oblique cutting, shear angle, velocity relationship. Merchant's analysis of cutting forces, cutting power estimation. Inserts- chip groove geometries; nomenclature, selection and applications in turning, milling, drilling. Carbide grade design, carbide coatings. Advances in cutting tool materials. Effect of cutting variables on forces. Tool failure analysis, theories of tool wear, measurement of tool wear. Tool dynamometers, thermal aspects of machining, Tool life and economics of machining, CNC machining. Micro machining.

Module 2 (12 hours)

Basic concepts of machine tools: Tool –work motions, machine tools for various machining processes, kinematics of machine tools and gear boxes, feed and speed mechanism, machine tool drives, machine tool dynamics, gear manufacture- milling, hobbing and shaping, special purpose machine tools, hydraulic control of machine tools, components of hydraulic circuits, control circuits and their characteristics, testing of machine tools for positioning accuracy and repeatability.

Module 3 (10 hours)

Modern machining processes: Mechanics of AJM, EDM, USM, EBM and ECM, process parameters and applications.

Module 4 (10 hours)

Jigs and fixtures, basic principles of location, type and mechanics of locating and clamping elements, design of jigs and fixtures.

References:

1. A. Ghosh & A.K. Mallik; Manufacturing Science, Affiliated East West Press.
2. B.L. Juneja & G.S. Skekhon; Fundamentals of Metal Cutting and machine Tools, Wiley Eastern
3. Sen & Bhattacharya; Principles of Machine Tools, New Central Agency.
4. A. Bhattacharyya; Metal Cutting: Theory & Practice, Central book publishers.
5. M.C. Shaw; Metal Cutting Principles, CBS Publishers.
6. HMT; Production Technology - Tata Mc Graw Hill.
7. Serope Kalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology, Pearson Education.
8. N.K. Mehta; Machine Tool Design and Numerical Control, Tata Mc Graw Hill
9. Geoffrey Boothroyd & W.A. Knight; Fundamentals of Machining and Machine Tools, Marcel Dekkel
10. ASTME; Fundamentals of Tool Design, Prentice-Hall of India.
11. Chapman; Workshop Technology, Vol. 1, Vol. 2, Vol.3.
12. Khaimovitch; Hydraulic control of Machine tools, Pergamon Press
13. Anthony Esposito; Fluid Power with Applications, Pearson Education.
14. Ernst; Oil Hydraulics Power, Industrial Applications, McGraw Hill Book Company
15. Kempster, M.H.A.; An Introduction to Jig and Tool Design, ELBS
16. Donaldson, Lecain and Goold; Tool design, Tata Mc Graw Hill