

MACHINE TOOLS

Course Code: 22ME1111

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Course Outcomes: At the end of the course, the student will be able to

CO1: Explain metal cutting principles

CO2: Describe the details and operations on lathe

CO3: Discuss shaping, slotting, planning, drilling and boring operations

CO4: Explain the details and operations on milling machine

CO5: Differentiate among various finishing operations

UNIT- I

10 Lectures

Fundamentals of Machining: Introduction, mechanics of cutting, geometry of single point cutting tool, types of chips produced in metal cutting, chip breakers, orthogonal cutting and oblique cutting, cutting Forces-Merchants circle, power estimation and temperatures generated in cutting, tool life, tool wear, machinability, cutting tool materials, cutting fluids-functions, types.

Learning Outcomes: At the end of this unit, the student will be able to

1. describe the mechanism of metal cutting (L2)
2. differentiate between orthogonal and oblique cutting (L2)
3. calculate various cutting forces in metal cutting (L3)

UNIT- II

10 Lectures

Lathe: Principle of Lathe, types of lathes, lathe components, specifications, tool and work holding devices, Lathe operations, material removal rate, machining time. Turret and capstan lathes: collet chucks, tool holding devices, tool layout, principal features of automatic lathes, classification, single spindle and multi-spindle automatic lathes.

Learning Outcomes: At the end of this unit, the student will be able to

1. explain the working of various lathe machines (L2)
2. discuss various operations performed on lathe machine (L2)
3. describe the applications of various work holding devices (L2)

UNIT- III

10 Lectures

Shaping, Slotting and Planning: Principle of working, classification, specifications, operations performed, machining time calculations.

Drilling and Boring: Principle of working, types, and operations performed, specifications tool holding devices, twist drill, Jig boring.

Learning Outcomes: At the end of this unit, the student will be able to

1. explain working of shaper, slotter and planer (L2)

2. explain the quick return mechanism used in shaper, slotter and planer (L2)
3. describe the various drilling and boring machines (L2)

UNIT- IV

10 Lectures

Milling: Principle of working, classification of milling machines, specification, principal features of horizontal, vertical and universal milling machines, milling operations, types milling cutters, geometry of milling cutter, methods of indexing, accessories to milling machines.

Broaching: Principle of broaching, Advantages, Types of broaching machines, broaching tools, broaching operations.

Learning Outcomes: At the end of this unit, the student will be able to

1. explain working of various milling machines (L2)
2. discuss different milling cutters and milling operations (L2)
3. describe applications of broaching machines (L2)

UNIT- V

10 Lectures

Abrasive Machining and Finishing Operations: Introduction, classification of grinding machine, cylindrical and surface grinding machine, tool and cutter grinding machine, designation of a grinding wheel. Lapping and honing processes.

Jigs and Fixtures:, Introduction, 3-2-1 principles of location and clamping, Classification of jigs and fixtures, types of clamps

Learning Outcomes: At the end of this unit, the student will be able to

1. describe the working of various grinding machines (L2)
2. explain working and applications of lapping and honing process (L2)
3. differentiate between jigs and fixtures (L2)

Text Book:

1. Ghosh Amitabha, A. K. Mallik, *Manufacturing Science*, 2nd Edition, Affiliated East-West Press, 2010. (for Unit-I)
2. P. N. Rao, *Manufacturing Technology Volume 2: Metal Cutting and Machine Tools*, 3rd Edition, McGraw Hill, 2013. (for Unit-II to Unit-V)

References:

1. Kalpakjian and S R Schmid, *Manufacturing Engineering and Technology*, 5th Edition, Pearson, 2006.
2. R.K. Jain and S.C. Gupta, *Production Technology*, 16th Edition, Khanna Publishers, 2001.
3. Geoffrey Boothroyd, Winston A. Knight, *Fundamentals of Metal Machining and Machine Tools*, 3rd Edition, T&F India, 2006.
4. Mikell P. Groover, *Fundamentals of Modern Manufacturing*, 4th Edition, John Wiley & Sons, 2010.
5. Hindustan Machine Tools, *Production Technology*, McGraw Hill Education, 2017.

