III B. TECH - I SEMESTER
METAL CUTTING & MACHINE TOOLS

Course Code: ME5T2 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Provide the basic concepts in mechanics of metal cutting, chip formation, various tool materials and tool life.
- Impart the concept of types of lathe, various operations that can be performed in various lathes, various mechanisms adopted.
- Instruct the working principle, operations performed, work, tool holding devices and different attachments in milling and drilling machines.
- Educate the basic fundamentals of reciprocating machine tools shaper, slotter and planning machines.
- Acquaint with the fundamentals of finishing process, super finishing process and their associated machine tools.

COURSE OUTCOMES:

At the end of course the students will be able to:

1. Demonstrate fundamentals of metal removal processes
2. Illustrate working principle, mechanism and various operations performed on lathe
3. Explain the mechanisms of shaper, planner and slotter and various machining operations Performed.
4. Describe drilling and grinding machines, various operations and Nomenclature of Cutters
5. Discuss milling machines, various operations and Nomenclature of Cutters

UNIT I

BASICS OF METAL CUTTING: Elementary treatment of metal cutting theory – elements of cutting process – geometry of single point cutting tools, chip formation and types of chips – built up edge and its effects, chip breakers. Mechanics of orthogonal cutting – Merchant's force diagram, cutting forces, Tool wear, tool life, machinability, cutting fluids, tool materials.

UNIT II

LATHE: Engine lathe – principle of working, specification of lathe – types of lathe – work, tool holding devices for lathes, accessories and attachments- Taper turning, Thread cutting – lathe operations, Capstan and Turret lathes – collet chucks – other work holding, tool holding devices –tool layout.

Principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes.

UNIT III

SHAPING, SLOTTING AND PLANING MACHINES: Types, Principles of working – principal parts – specifications, operations performed, work holding devices, machining time calculations.

UNIT IV

DRILLING & BORING MACHINES: Principles of working, specifications, types, operations performed – tool holding devices, work holding devices – twist drill –reamers-Boring Machines – fine Boring Machines – jig boring machine, deep hole Drilling Machine.

GRINDING: Theory of grinding – classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines, different types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, Honing & Broaching operations, comparison to grinding.

UNIT V

MILLING MACHINE: Types, Principles of working – specifications – classification of Milling Machines – principal features of horizontal, vertical and universal Milling Machine, machining operations, types of cutters, geometry of milling cutters, work holding devices, cutter holding devices – methods of indexing, accessories to milling machines, gear cutting.

Learning Resources

Text Books:

1. Manufacturing technology - Metal cutting and Machine tools, 2nd edition by P.N Rao, TMH publications, 2000.
2. Machining and machine tools, by A.B. Chattopadhyay, wiley india pvt. Limited, 2011.

Reference Books:

1. Metal cutting Principles, by M.C. Shaw, 3rd ed., Oxford, 1957.
2. Production Technology, by HMT, (Hindustan Machine Tools), TMH publications 2001.
3. Workshop Technology Vol II, (10th edition), by B.S.Raghu Vamshi, Dhanpat Rai & co (p) Ltd., 2009.
4. Manufacturing Science, by Amitabha Ghosh and Asok Kumar Mallik, East West Press, 2nd Edition, 2010.