

II Year II Semester

L T P C

Code:20ME4005

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METAL CUTTING AND MACHINE TOOLS

Course Objectives:

1. The course provides students with fundamental knowledge and principles in material removal processes through multiple labs using lathes, milling machines, grinding machines, and drill presses, Computer Numerical Control etc.
2. The course will help the students to develop a knowledge on metal cutting parameters, fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms and also helps to calculate the machining parameters for different machining processes.

UNIT – I FUNDAMENTAL OF MACHINING:

Elementary treatment of metal cutting theory – element of cutting process – Single point cutting tools, nomenclature of single point cutting tool, tool signature, tool angles, mechanism of metal cutting, types of chips and chip formation – built up edge and its effects, chip breakers, mechanics of orthogonal and oblique cutting –Merchant’s force diagram, cutting forces, velocity ratio, cutting speeds, feed, depth of cut, tool life, Taylor’s tool life equation, simple problems - Tool wear, tool wear mechanisms, heat generation in metal cutting, coolants, machinability, economics of machining, tool materials and properties-Ceramic tools: Titanium carbide tools.

UNIT – II LATHE MACHINES:

Introduction- types of lathe - Engine lathe – principle of working - construction - specification of lathe -work holders and tool holders – accessories and attachments – lathe operations – taper turning methods and thread cutting – drilling on lathes – cutting speed and feed - constructional features of speed gear box and feed gear box - turret and capstan lathes – collet chucks – other work holders – tool holding devices-Jigs and Fixtures–box and tool layout- principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes – tool layout and cam design for automats.

UNIT – III SHAPING, SLOTTING AND PLANNING MACHINES:

Introduction - principle of working –principal parts – specifications - operations performed - slider crank mechanism

DRILLING & BORING MACHINES: Introduction – construction of drilling machines – types of drilling machines - principles of working – specifications- types of drills–tool holding devices - operations performed – cutting speed and feed –Boring Machines – fine Boring Machines – jig boring machines.

UNIT – IV MILLING MACHINES:

Introduction - principle of working – specifications – milling methods -classification of Milling Machines – principal features of horizontal, vertical and universal Milling Machine, machining operations, types of cutters - geometry of milling cutters – methods of indexing, accessories to milling machines - cutting speed and feed – machining time calculations.

UNIT –V FINISHING PROCESSES:

Introduction - 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.

TEXT BOOKS:

1. Manufacturing Engineering and Technology -Kalpakjian S & Steven R Schmid/PearsonPublication's 7th Edition
2. Manufacturing Technology Vol-II/P. N Rao/Tata McGraw Hill

REFERENCES:

1. Metal cutting and machine tools /Geoffrey Boothroyd, Winston A.Knight/ Taylor & Francis
2. Production Engineering/K.C Jain & A.K Chitale/PHI Publishers
3. Technology of machine tools/S.F.Krar, A.R. Gill, Peter SMID/ TMH
4. Fundamentals of modern manufacturing – Mikell P Groover – John Wiley & sons -5th edition

Weblinks/ Online Resources:

- <https://nptel.ac.in/courses/112/105/112105233/>
- <https://www.classcentral.com/course/swayam-elements-of-metal-cutting-machine-tools-gear-cutting-and-cnc-machining-43587>
- <https://gradeup.co/metal-cutting-notes-i-fcd42ea0-a373-11e7-a884-826488875dce>

Course Outcomes:

On the completion of the course the student will able to

CO1: Learned the fundamental knowledge and principals in material removal process.

CO2: Acquire the knowledge on operations in conventional, automatic, Capstan and turret lathes

CO3: capable of understanding the working principles and operations of shaping, slotting, planning, drilling and boring machines.

CO4: Able to make gear and keyway in milling machines and understand the indexing mechanisms

CO5: Understand the different types of unconventional machining methods and principles of finishing processes.