METAL CUTTING & MACHINE TOOLS

Course objectives:
1. The course provides students with fundamental knowledge and principles in material removal processes.
2. In this course, the students apply the fundamentals and principles of metal cutting to practical applications through multiple labs using lathes, milling machines, grinding machines, and drill presses, Computer Numerical Control etc.
3. To demonstrate the fundamentals of machining processes and machine tools.
4. To develop knowledge and importance of metal cutting parameters.
5. To develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.
6. To apply knowledge of basic mathematics to calculate the machining parameters for different machining processes.

UNIT – I
FUNDAMENTALS OF MACHINING:
Elementary treatment of metal cutting theory – element of cutting process – geometry of single point tool angles, chip formation and types of chips – built up edge and its effects chip breakers, mechanics of orthogonal cutting – Merchant’s force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, coolants, tool materials.

UNIT – II
LATHE MACHINES:

UNIT – III
SHAPING, SLOTTING AND PLANNING MACHINES: Principles of working – principal parts – specifications, operations performed, machining time calculations.
DRILLING & BORING MACHINES: Principles of working, specifications, types, operations performed – tool holding devices – twist drill
 – Boring Machines – fine Boring Machines – jig boring machine, deep hole Drilling Machine.

UNIT – IV

UNIT – V
FINISHING PROCESSES: 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 - VI
JIGS & FIXTURES: Principles of design of jigs and fixtures and uses, classification of jigs & fixtures, principles of location and clamping, types of clamping & work holding devices, typical examples of jigs and fixtures.

CNC MACHINE TOOLS: CNC Machines, working principle, classification, constructional features of CNC machines, CNC controller, types of motion controls in CNC machines, applications of CNC machines.

TEXT BOOKS:
2. Workshop Technology – B.S.Raghu Vamshi – Vol II

REFERENCES:
1. Metal cutting Principles by M.C. Shaw
2. Metal cutting and machine tools by Boothroyd
5. Manufacturing technology II, P.N Rao
6. Technology of machine tools, S.F.Krar, A.R. Gill, Peter SMID, TMH (I)

Course Outcomes :
Upon successful completion of this course, the students will be able to:
1) Apply cutting mechanics to metal machining based on cutting force and power consumption.
2) Operate lathe, milling machines, drill press, grinding machines, etc.
3) Select cutting tool materials and tool geometries for different metals.
4) Select appropriate machining processes and conditions for different metals.
5) Learn machine tool structures and machining economics.
6) Write simple CNC programs and conduct CNC machining.