



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF MECHANICAL ENGINEERING

II Year - II Semester		L	T	P	C
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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

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.

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 – 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 – principle parts – specifications - operations performed - slider crank mechanism - machining time calculations.

DRILLING & BORING MACHINES: Introduction – construction of drilling machines – types of drilling machines - principles of working – specifications- types of drills – geometry of twist drill - tool holding devices - operations performed – tool holding devices – cutting speed and feed – machining time calculations - Boring Machines – fine Boring Machines – jig boring machines - deep hole Drilling Machines.



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UNIT – IV

MILLING MACHINES: Introduction - principle of working – specifications – milling methods - classification of Milling Machines – principle 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/Pearson Publications 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 Chitaley/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

Course Outcomes:

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.