



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA 533003, Andhra Pradesh, India
DEPARTMENT OF MECHANICAL ENGINEERING

III Year-I Semester	L	T	P	C
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MACHINING, MACHINE TOOLS & METROLOGY				

Course objectives:

- 1) To gain fundamental knowledge of machining processes.
- 2) To understand the principles of lathe, shaping, slotting and planning machines.
- 3) To demonstrate the principles of drilling, milling and boring processes.
- 4) To understand the concepts of finishing processes and the system of limits and fits.
- 5) To gain knowledge about the concepts of surface roughness and optical measuring instruments.

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, fe - Tool wear, tool wear mechanisms, machinability, economics of machining, coolants, 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-depth of cut.

SHAPING, SLOTTING AND PLANNING MACHINES: Introduction - principle of working – principle parts specifications - operations performed - slider crank mechanism - machining time calculations.

UNIT- III:

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

MILLING MACHINES: Introduction - principle of working – specifications – milling methods - classification of Milling Machines –types of cutters - geometry of milling cutters – methods of indexing, accessories to milling machines - cutting speed and feed – machining time calculations



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UNIT– IV:

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.

SYSTEMS OF LIMITS AND FITS: Introduction, nominal size, tolerance, limits, deviations, different types of fits -Unilateral and bilateral tolerance system, hole and shaft basis systems- interchangeability, deterministic & statistical tolerances, selective assembly- International standard system of tolerances, selection of limits and tolerances for correct functioning, simple problems related to limits and fits, Taylor’s principle – design of go and no go gauges; plug, ring, snap, gap, taper, profile and position gauges inspection of gauges.

UNIT– V:

SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surface waviness –Numerical assessment of surface finish-CLA, Rt., R.M.S. Rz, R10 values, simple problems - method of measurement of surface finish – Profilograph, Talysurf, ISI symbols for indication of surface finish.

OPTICAL MEASURING INSTRUMENTS: Tools maker’s microscope, Autocollimators, Optical projector, Optical flats-working principle, construction, merits, demerits and their uses. optical comparators.

TEXT BOOKS:

- 1) Manufacturing Processes / JP Kaushish/ PHI Publishers-2nd Edition
- 2) Manufacturing Technology Vol-II/P.N Rao/Tata McGraw Hill
- 3) Engineering Metrology – R.K. Jain/Khanna Publishers

REFERENCES:

- 1) Metal cutting and machine tools /Geoffrey Boothroyd, Winston A.Knight/ Taylor & Francis
- 2) Production Technology / H.M.T. Hand Book (Hindustan Machine Tools).
- 3) Production Engineering/K.C Jain & A.K Chitale/PHI Publishers
- 4) Technology of machine tools/S.F.Krar, A.R. Gill, Peter SMID/ TMH
- 5) Manufacturing Processes for Engineering Materials-Kalpak Jian S & Steven R Schmid/Pearson Publications 5th Edition

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

CO1: Discuss the concepts of machining processes.

CO2: Apply the principles of lathe, shaping, slotting and planning machines.

CO3: Apply the principles of drilling, milling and boring processes.

CO4: Analyze the concepts of finishing processes and the system of limits and fits.

CO5: Learn the concepts of surface roughness and optical measuring instruments.