MACHINE TOOLS AND METROLOGY

Course code	23ME3501	**Year**	III	**Semester**	I
Course category	Professional Core	**Branch**	ME	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Material Science and Metallurgy, Manufacturing Processes
ContinuousInternal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		**Blooms-level**
CO1	Learned the fundamental knowledge and principals of metal cutting and material removal process and the basic concepts of Metrology.	**L2**
CO2	Acquire the knowledge on operations in conventional, lathes, working principles and operations of shaping, slotting, planning, drilling and boring machines.	**L3**
CO3	Capable of understanding the milling machines and understand various machining processes and indexing mechanisms.	**L3**
CO4	Classify and compare finishing operations, apply the concept of limits, fits, and tolerances, design and interpret go/no-go gauges based on Taylor's principle	**L3**
CO5	Illustrate the construction and working of instruments used for linear and angular measurement Optical measuring instruments.	**L3**

Contribution of Course outcomes towards the achievement of program outcomes & Strength of correlations (High :3,Medium:2,Low:1)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	2	1	2	2					1		3	2
CO2	3	2	2	2	2				1	1	1	3	2
CO3	3	2	2	2	2				1	1	1	3	2
CO4	3	3	2	2	2				1	2	1	3	2
CO5	3	2	1	2	3				1	2		3	2

SYLLABUS		
Unit No.	**Contents**	**Mapped CO**
I	**FUNDAMENTALS OF MACHINING:** Elementary treatment of metal cutting theory – element of cutting process – Single point cutting tools, nomenclature, tool signature, mechanism of metal cutting, types of chips, mechanics of orthogonal and oblique cutting – Merchant's force diagram, cutting forces, Taylor's tool life equation, simple problems - Tool wear, tool wear mechanisms, machinability, economics of machining, coolants, tool materials and properties.	**CO1**

II	**LATHE MACHINES:** Introduction- types of lathes - Engine lathe – principle of working - construction - specification of lathe - accessories and attachments – lathe operations – taper turning methods and thread cutting **SHAPING, SLOTTING AND PLANNING MACHINES:** Introduction - principle of working – principal parts – specifications - operations performed - slider crank mechanism - machining time calculations.	**CO1,** **CO2**
III	**DRILLING & BORING MACHINES:** Introduction – construction of drilling machines – types of drilling machines - principles of working – specifications- types of drills - operations performed – machining time calculations - Boring Machines – types. **MILLING MACHINES:** Introduction - principle of working – specifications – milling methods - classification of Milling Machines –types of cutters - methods of indexing- machining time calculations	**CO1, CO3**
IV	**FINISHING PROCESSES:** Classification of grinding machines- types of abrasives- bonds, specification and selection of a grinding wheel- Lapping, Honing & Broaching operations- comparison to grinding. **SYSTEMS OF LIMITS AND FITS:** Types of fits -Unilateral and bilateral tolerance system, hole and shaft basis systems- interchangeability & selective assembly- International standard system of tolerances, 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. **SURFACE ROUGHNESS MEASUREMENT:** Differences between surface roughness and surface waviness –Numerical assessment of surface finish, Profilograph, Talysurf, ISI symbols.	**CO1, CO4**
V	**LINEAR MEASUREMENT:** Length standards, end standards, slip gauges- calibration of the slipGauges, dial indicators, micrometers. **ANGULAR MEASUREMENT:** Bevel protractor, angle slip gauges- angle dekkor- spirit levels- sine bar- sine table. **OPTICAL MEASURING INSTRUMENTS:** Tools maker's microscope, Autocollimators, Optical projector, Optical flats-working principle, construction, merits, demerits and their uses. optical comparators.	**CO1, CO5**

LearningResource
Textbooks:
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
Referencebooks
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 Chitaley/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 1. Workshop Technology Vol II, (10th edition), by B.S.Raghu Vamshi, Dhanpat Rai, & co (p) Ltd., 2009.
E-Resources&otherdigitalMaterial:

1. https://nptel.ac.in/courses/112105233
2. https://nptel.ac.in/courses/112/104/112104250/