DEPARTMENT OF MECHANICAL ENGINEERING

LESSON PLAN

Course Code	Course Title	Semester	Branche	Contact Periods /Week	Academic Year	Date of commencement of Semester
23ME5T01	Machine Tools & Metrology	V	MECHANICAL ENGG.	6	2026-27	22-06-2026

COURSE OUTCOMES	
CO1	Describe the fundamental knowledge and principles in material removal process. [K2]
CO2	Acquire the knowledge on operations in conventional, automatic, Capstan and turret lathes. [K3]
CO3	Summarize the working principles and operations of shaping, slotting, planning, drilling and boring machines. [K2]
CO4	Discuss the making of gear and keyways in milling machines and understand the indexing mechanisms. [K2]
CO5	illustrate the Linear & Angular Measurement. [K3]
CO6	Classify the different types of Surface roughness and Optical measuring instruments. [K2]

UNIT	Out Comes / Bloom's Level	Topics No.	Topics/Activity	Textbook / Reference	Contact Hour	Delivery Method
UNIT-I - FUNDAMENTALS OF MACHINING						
I	Describe the fundamental knowledge and principals in material removal process. [K2]	1.1	Elementary treatment of metal cutting theory	T1, T2, R1	1	Chalk & Talk, PPT, PBL, NPTEL video
		1.2	Elements of cutting process	T1, T2, R1	1	
		1.3	Nomenclature of single point cutting tool, Tool Signature.	T1, T2, R1	1	
		1.4	Mechanism of Metal Cutting.	T1, T2, R1	1	
		1.5	Chip formation and types of chips.	T1, T2, R1	1	
		1.6	Mechanics of orthogonal and Oblique cutting.	T1, T2, R1	1	
		1.7	Merchant's force Circle Diagram, cutting forces	T1, T2, R1	1	
		1.8	Taylor's tool life equation and Simple Problems.	T1, T2, R1	1	
		1.9	Tool Wear, Toole Wear mechanisms.	T1, T2, R1	1	

		1.1	Machinability, Economics of Machining.	T1, T2, R1	1	
		1.11	Coolants, Tool materials and properties.	T1, T2, R1	1	
CBS		1.12	Tool Dynamometers	Web	1	
Total					**12**	
UNIT-II - LATHE MACHINES						
II	Acquire the knowledge on operations in conventional, automatic, Capstan and turret lathes. [K3]	2.1	Introduction- Types of lathes.	T1, T2, R2	1	Chalk & Talk, PPT, Working animation video,
		2.2	Working Principle and Construction of Engine Lathe.	T1, T2, R2	1	
		2.3	Specification of Lathes	T1, T2, R2	1	
		2.4	Accessories and Attachments of Lathes.	T1, T2, R2	1	
		2.5	Lathe Operations: Taper Turning and Tread Cutting	T1, T2, R2	1	
		2.6	Drilling Operation on Lathe.	T1, T2, R2	1	
		SHAPING, SLOTTING AND PLANNING MACHINES				
		2.7	Introduction to Shaping, Slotting and planning Machines.	T1, T2, R2	1	
		2.8	Working Principle, Parts and Specifications of Shaper.	T1, T2, R2	1	
		2.9	Working Principle, Parts and Specifications of Slotter.	T1, T2, R2	1	
		2.1	Working Principle, Parts and Specifications of Planner.	T1, T2, R2	1	
		2.11	Operations performed on Shaper, Slotter and Planner.	T1, T2, R2	1	
		2.12	Mechanisms in Shaper, Slotter and Planner.	T1, T2, R2	1	
		2.13	Estimating and machining time calculation simple problems.	T1, T2, R2	1	
CBS		2.14	Composite materials used for Cutting Tools.	Web.	1	
Total					**14**	
UNIT-III - DRILLING & BORING MACHINES						
III	Summarize the working principles and operations of shaping, slotting, planning, drilling and boring machines. [K2]	3.1	Introduction about Drilling Machines and Boring Machines.	T1, T2, R1	1	Chalk & Talk, PPT, Web resources,
		3.2	Working Principle and Construction of Drilling Machines and Boring Machines	T1, T2, R1	2	
		3.3	Specifications and Types of Drilling Machines and Boring Machines.	T1, T2, R1	2	
		MILLING MACHINES				
		3.4	Introduction about Milling Machines.	T1, T2, R1	1	
		3.5	Working Principle and Construction of Milling Machines.	T1, T2, R1	1	

		3.6	Milling Methods and Classification of Milling Machines	T1, T2, R1	2	
		3.7	Types of Cutters and Indexing Methods.	T1, T2, R1	2	
		3.8	Machining time calculation.	T1, T2, R1	1	
CBS		3.9	Helical and Spiral Milling	T1, T2, R1	1	
Total					**13**	
UNIT-IV - FINISHING PROCESSES						
IV	Discuss the making of gear and keyway in milling machines and understand the indexing mechanisms. [K2]	4.1	Classification of Grinding Machines	T1, T2, R1	1	Chalk & Talk, PPT, NPTEL video course
		4.2	Types of Abrasives and Bonds	T1, T2, R1	1	
		4.3	Specification and Selection of Grinding Wheel.	T1, T2, R1	1	
		4.4	Lapping, Honing and Broaching Operations.	T1, T2, R1	1	
		4.5	Comparison between Broaching and Grinding Operation.	T1, T2, R1	1	
			SYSTEMS OF LIMITS AND FITS			
		4.6	Introduction to Fits and Tolerances and its types.	T1, T2, R1	1	
		4.7	Unilateral and Bilateral tolerance system.	T1, T2, R1	1	
		4.8	Hole and Shaft Basis system.	T1, T2, R1	1	
		4.9	Interchangeability and Selective Assembly.	T1, T2, R1	1	
		4.10	International Standard system of Tolerance	T1, T2, R1	1	
		4.11	Simple problems related to Limits and Fits.	T1, T2, R1	1	
		4.12	Taylor's Principle.	T1, T2, R1	1	
		4.13	design of go and no go gauges;	T1, T2, R1	1	
		4.14	plug, ring, snap, gap, taper, profile and position gauges	T1, T2, R1	1	
CBS		4.15	Process Capabilities.	Web	1	
Total					**15**	
UNIT – V - MEASUREMENTS						
V	CO5: illustrate the Linear & Angular Measurement. [K3].	5.1	**Linear Measurements:** Introduction about Measurement and Standards.	T1, T2, R2	1	Chalk & Talk, PPT, NPTEL video course,
		5.2	Length standards, End standards	T1, T2, R2	1	
		5.3	Slip Gauges: Calibration of Slip Gauges. Vernier Caliper	T1, T2, R2	1	
		5.4	Dial Indicators and Micrometers	T1, T2, R2	2	
		5.5	**Angular Measurements:** Bevel Protractor, Angle Slip Gauges and Angle Dekkor.	T1, T2, R2	2	

		5.6	Spirit Level and Sine Bars.	T1, T2, R2	1	
		5.7	**Surface Roughness Measurement:** Differences between surface roughness and surface waviness	T1, T2, R2	1	
		5.8	Numerical assessment of surface finish	T1, T2, R2	1	
		5.9	Profilograph, Taly surf, ISI symbols	T1, T2, R2	1	
		5.10	**Optical measuring instruments:** Tools maker's microscope, Autocollimators and Optical projector.	T1, T2, R2	2	
		5.11	Optical flats-working principle, construction, merits, demerits	T1, T2, R2	1	
		5.12	Optical Comparators: working principle, construction, merits, demerits	T1, T2, R2	1	
CBS		5.13	Graphical representation of Frequency Distribution.	Web	1	
Total					**16**	
CUMULATIVE PROPOSED PERIODS				**Total**	70	

Textbooks:	
S. No.	
T1	R.K. Jain, Production Technology, 1st edition, Khanna Publishers, 2012.
T2	P.N.Rao, Manufacturing Technology: Metal Cutting and Machine Tools, 4th edition, McGraw-Hill Education, 2018.
T3	Chital, A.K., and Jain, K.C., Textbook of production Engineering, 2nd edition, PHI Learning India, 2014
Reference Books:	
S. No.	
R1	Milton Clayton Shaw, Metal cutting principles, 2nd edition, Oxford University Press, 2005
R2	Winston A Knight, and Geoffrey Boothroyd, Fundamentals of machining and machine tools, 3rd edition, Taylor & Francis, 2006.
Web Details	
1	https://youtu.be/ljveGnQw2G0?list=PL9ssGyHa3fnwPH1gSkV8pjX12Srkx8rgq
2	https://youtu.be/sG6GCfX7L3c , https://www.slideshare.net/slideshow/shaping-slotting-and-planning-machines/65881088
3	https://www.slideshare.net/slideshow/drilling-and-boring/63436971 https://youtu.be/Chs55TQZOSk
4	https://egyankosh.ac.in/bitstream/123456789/27171/1/Unit-6.pdf https://www.acsce.edu.in/acsce/wp-content/uploads/2020/04/Mechanical-Measurements-Metrology-Module-2-3.pdf
5	https://erode-sengunthar.ac.in/wp-content/uploads/2019/04/UNIT-1.pdf https://youtu.be/Z6evuxYjYMs?list=PLSGws_74K019wiWyVU3CnVMMqAcF3_sxz

		Name	Signature with Date
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