

## Department of Mechanical Engineering

### Lesson Plan & Work-Done Diary for AY:2023-24, Even Semester

Course with Code: Machining Science & Metrology [BME402]				Faculty: Prof. Devaraj M R			Semester & Section: 4 <sup>th</sup> Sem	
Class No.	Date Planned (DD/MM)	Topics to be covered	TLP Planned	Class No.	Date of Conduction (DD/MM)	Topics Covered	TLP Executed	Remarks if any deviation
<b>MODULE-1:</b>								
1		<b>Introduction to Metal cutting:</b> Orthogonal and oblique cutting.	Chalk & Talk PPT					
2		Classification of cutting tools: single, and multipoint; tool signature for single point cutting tool.	Chalk & Talk PPT					
3		Mechanics of orthogonal cutting; chip formation, shear angle and its significance,	Chalk & Talk PPT					
4		Merchant circle diagram. Numerical problems.	Chalk & Talk PPT					
5		Merchant circle diagram. Numerical problems.	Chalk & Talk PPT					
6		Cutting tool materials and applications.	Chalk & Talk PPT					

7		<b>Introduction to basic metal cutting machine tools: Lathe-</b> Parts of lathe machine, accessories of lathe Machine and	Chalk & Talk PPT					
8		various operations carried out on lathe. Kinematics of lathe.	Chalk & Talk PPT					
9		Turret and Capstan lathe.	Chalk & Talk PPT					
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<b>MODULE-2:</b>								
10		<b>Milling Machines:</b> up milling & down milling, classification of milling machines,	Chalk & Talk PPT & Video					
11		constructional features (Column and Knee and vertical milling machine), milling cutter nomenclature,	Chalk & Talk PPT & Video					
12		various milling. operations, calculation of machining time.	Chalk & Talk PPT & Video					
L1		Preparation of one model on lathe involving - Plain turning, Facing, Knurling, Drilling, Boring, Internal Thread cuts and Eccentric turning.	Lab Visit	1				
L2		Preparation of One model on lathe involving - Plain turning, Facing, Taper turning, Step turning, Thread cutting, Facing, Knurling, Drilling, Boring, Internal Thread cutting and Eccentric turning.	Lab Visit	2				

13		<b>Indexing:</b> Need of indexing Simple, compound and differential indexing	Chalk & Talk PPT					
14		calculations. Simple numerical on indexing.	Chalk & Talk PPT					
15		<b>Shaping, Slotting and Planning Machines Tools:</b> Driving mechanisms of Shaper, Slotter, and Planer.	Chalk & Talk PPT					
16		Operations done on Shaper, Planer & Slotter Difference between shaping and planning operations.	Chalk & Talk PPT					
17		<b>Drilling Machines:</b> Constructional features (Radial & Bench drilling Machines), operations,	Chalk & Talk PPT					
18		types of drill & drill bit nomenclature. Calculation of machining time.	Chalk & Talk PPT					
19		<b>Grinding:</b> Grinding operation, classification of grinding processes: cylindrical, surface & centreless grinding	Chalk & Talk PPT					
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<b>MODULE-3:</b>								
20		<b>Thermal aspects, Tool wear, and Machinability</b> <b>Temperature in Metal Cutting:</b> Heat generation in metal cutting; temperature distribution in metal cutting,	Chalk & Talk PPT					

21		<b>Temperature in Metal Cutting:</b> Heat generation in metal cutting; temperature distribution in metal cutting,	PPT & Video					
22		effect of cutting speed on temperatures, measurement of cutting temperatures.	Chalk & Talk PPT					
23		Tool life and tool Wear: progressive tool wear.	Chalk & Talk PPT					
24		<b>forms of wear in metal cutting:</b> crater wear, flank wear, tool-life criteria,	Chalk & Talk PPT					
25		cutting tool materials: basic requirements of tool materials,	Chalk & Talk PPT					
26		major classes of tool materials: high-speed steel, cemented carbide, ceramics,	Chalk & Talk PPT					
27		CBN and diamond, tool coatings; the work material and its machinability	Chalk & Talk PPT					
28		<b>Cutting fluids:</b> Action of coolants and application of cutting fluids.	Chalk & Talk PPT					
L3		One Job, Cutting of V Groove/ dovetail / Rectangular groove using a shaper.	Lab Visit	3				
L4		Cutting of Gear Teeth using Milling Machine.	Lab Visit	4				

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<b>MODULE-4:</b>								
29		<b>Introduction:</b> Introduction to metrology & measurements, definition, objectives and classification of metrology,	Chalk & Talk PPT					
30		standards of length- wavelength standard, subdivision of standards,	Chalk & Talk PPT					
31		numerical problems on length calibration.	Chalk & Talk PPT					
32		<b>Line &amp; End Standards:</b> Line and end standard, slip gauges,	Chalk & Talk PPT					
33		wringing phenomena, numerical. problems on slip gauges.	PPT & Video					
34		<b>Systems of Limits, Fits &amp; Tolerance:</b> Definition of tolerance, tolerance specification in assembly,	Chalk & Talk PPT					
35		principle of interchangeability and selective assembly, limits of size, Indian standards,	Chalk & Talk PPT					
36		concepts of limits of size and tolerances, cost v/s tolerances, compound tolerances, accumulation of tolerances,	Chalk & Talk PPT					
37		definition of fits, types of fits and their designation.	Chalk & Talk PPT					
L5		Simple operations and One Job on the drilling and grinding machine.	Lab Visit	5				

L6		Cutting force measurement with dynamometers (Demonstration) for turning, drilling, grinding operations.	Lab Visit	6				
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<b>MODULE-5:</b>								
38		<b>Gauges:</b> Classification of gauges, Taylor's principle,	Chalk & Talk PPT					
39		design of GO, NO GO gauges, wear allowance on gauges,	Chalk & Talk PPT					
40		types of gauges- plain plug gauges, ring gauges, snap gauge, limit gauge,	Chalk & Talk PPT					
41		simple problems.	PPT & Video					
42		<b>Comparators:</b> Introduction to comparators, classification, characteristics,	Chalk & Talk PPT					
43		systems of displacement amplification in mechanical comparators,	Chalk & Talk PPT					
44		Reed type, Sigma comparator, Zeiss ultra-optimeter,	Chalk & Talk PPT					
45		Solex air gauge, ultrasonic gauges, LVDT.	Chalk & Talk PPT					
46		<b>Angular Measurements:</b> Bevel protractor, sine bar,	Chalk & Talk PPT					

47		angular gauges, numerical on building of angles.	Chalk & Talk PPT					
L7		Analysis of chip formation and chip reduction coefficient in turning of mild steel by HSS tool with different depth of cut, speed, and feed rate.	Lab Visit	7				
L8		Study & Demonstration of power tools like power drill, power hacksaw, portable hand grinding, cordless screw drivers, production air tools, wood cutter, etc., used in Mechanical Engineering.	Demo with PPT/ Chalk & Talk	8				
L9		Demonstration/Experimentation of simple programming of CNC machine operations.	Demo with PPT/ Chalk & Talk	9				
L10		Demonstration / Experiment on tool wears and tool life on anyone conventional machining process.	Demo with PPT/ Chalk & Talk	10				

	<b>Activity</b>	<b>Planned</b>	<b>Actual</b>	<b>Remarks</b>
1	Theory Classes	47		
2	Demonstrations & Lab Visit/ Experiment conduction	09		
3	Assignments/ Quizzes/ reports	2+3		
4	Tutorials/ Extra classes	-		
5	Internal Assessments	3		
6	ICT based Teaching. (% of usage in Curriculum)	80 to 85%		
<b>Planning</b>			<b>Execution</b>	
<b>Faculty Signature:</b>			<b>Faculty Signature:</b>	
<b>HoD Signature:</b>			<b>HoD Signature:</b>	