

**METAL CUTTING AND MACHINE TOOLS**

<b>Course Code</b>	20ME3502	<b>Year</b>	III	<b>Semester</b>	I
<b>Course Category</b>	Programme core	<b>Branch</b>	ME	<b>Course Type</b>	Theory
<b>Credits</b>	3	<b>L-T-P</b>	3-0-0	<b>Pre-requisites</b>	Production Technology
<b>Continuous Internal Evaluation</b>	30	<b>Semester End Evaluation</b>	70	<b>Total Marks</b>	100

**Course Outcomes:** At the end of the course students will be able to

CO	Statement	Skill	Blooms Level	Units
CO1	Discuss Geometry of single point single point cutting tool and Mechanics of machining.	Understand Communication	L2	1,2,3
CO2	Describe Tool reliability, materials and identify suitable cutting fluid for a machining operation.	Apply, Communication	L2	1,2,3,4,5
CO3	Illustrate working principle, mechanism and various operations performed on lathe, shaper and planner	Apply, Communication	L2	3
CO4	Discuss drilling machines, milling machines, and various operations performed.	Apply, Communication	L2	4
CO5	Specify suitable finishing process for a component.	Understand Communication	L2	5

**Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (H:High, M: Medium, L:Low)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO 1	3	2			2							2	3	1
CO 2	3	2			2							2	3	1
CO 3	3	2			2							2	3	1
CO 4	3	2			2							2	3	1
CO 5	3	2			2							2	3	1

**Syllabus**

UNIT	Course Content	Mapped COs
I	<p><b>GEOMETRY OF CUTTING TOOLS:</b> Geometry of single-point cutting tool: Tool-in hand system, ASA system, Significance of various angles of single point cutting tools, Orthogonal Rake System (ORS).</p> <p><b>MECHANICS OF MACHINING PROCESSES:</b> Orthogonal and Oblique cutting, Mechanics of Chip formation: Types of chips, chip-breakers, Chip reduction coefficient, shear angle, shear strain, Built-</p>	CO1, CO2

	Up-Edge and its effect in metal cutting, Merchant's analysis of metal cutting process - Various forces, power and specific energy in cutting, Problems on Tool Geometry and Mechanics of Machining, Theories of Metal Cutting: Ernst & Merchant, theory, Modified Merchant's theory, Lee & Shaffer Theory, Stress distribution at Chip-Tool Interface.	
<b>II</b>	<b>TOOL WEAR, TOOL LIFE, MACHINABILITY AND MACHINING ECONOMICS:</b> Wear Mechanisms, Types of tool wear, Tool Life and Machinability, Problems on Economics of Machining. <b>CUTTING TOOL MATERIALS:</b> Desirable Properties of tool materials, Characteristics of Cutting Tool Materials, indexable inserts, coated tools. <b>CUTTING FLUIDS:</b> Functions, characteristics and types, selection of cutting fluids.	<b>CO1, CO2</b>
<b>III</b>	<b>LATHE:</b> Types, Parts, Feed Mechanisms, Specifications of lathe, Lathe Operations, Accessories and Attachments, Machining time estimation, Capstan and Turret Lathes. <b>SHAPER AND PLANER:</b> Types, Specifications, Crank and slotted link mechanism, Stroke length and position adjustments, Automatic feed mechanisms, Shaper Vs Planer, Machining time estimation	<b>CO1, CO2 CO3</b>
<b>IV</b>	<b>DRILLING:</b> Types, Operations, Nomenclature of a Twist drill, Machining time estimation. <b>Milling:</b> Types, Up Milling Vs Down Milling, Types of milling cutters, Operations, Dividing head, Types of Indexing and problems on indexing.	<b>CO2, CO4</b>
<b>V</b>	<b>GRINDING:</b> Specification and selection of grinding wheels, Truing, Dressing, Classification of Grinding wheels, Types of Grinding Machines. <b>FINISHING PROCESSES:</b> Lapping, Honing and Super-finishing processes.	<b>CO2, CO5</b>

### Learning Resources

#### Text Books:

1. Manufacturing technology - Metal cutting and Machine tools, 2nd edition by P.N Rao, TMH publications, 2000.
2. Machining and machine tools, by A.B. Chattopadhyay, wiley india pvt. Limited, 2011.

#### Reference Books :

1. Metal cutting Principles, by M.C. Shaw, 3rd ed., Oxford, 1957.
2. Production Technology, by HMT, (Hindustan Machine Tools), TMH publications, 2001.
3. Workshop Technology Vol II, (10th edition), by B.S.Raghu Vamshi, Dhanpat Rai, & co (p) Ltd., 2009.
4. Manufacturing Science, by Amitabha Ghosh and Asok Kumar Mallik, East West, Press, 2nd Edition, 2010.

#### E- Resources & other digital material :

1. <https://nptel.ac.in/courses/112105233>