

**LOK JAGRUTI UNIVERSITY (LJU)**  
**INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**Department of Mechanical Engineering**  
**Bachelor of Engineering (B.E.) – Semester – III**

<b>Course Code:</b>	<b>017103302</b>	<b>Teaching Scheme</b>				
<b>Course Name:</b>	<b>Conventional Machining Processes</b>	<b>Lecture (L)</b>	<b>Tutorial (T)</b>	<b>Practical (P)</b>	<b>Credit</b>	<b>Total Hours</b>
<b>Category of Course:</b>	Professional Core Course (PCC)					
<b>Prerequisite Course:</b>	Mathematics 1 (017101191), Engineering Graphics 2 (017102293), Engineering Mechanics (017102291), Strength of Materials (017103391), Kinematics of Machines (017103392), Workshop Practice-Laboratory (017102193)	<b>3</b>	<b>1</b>	<b>2</b>	<b>5</b>	<b>40</b>

<b>Syllabus</b>				
<b>Unit No.</b>	<b>Topic</b>	<b>Prerequisite Topic</b>	<b>Successive Topic</b>	<b>Teaching Hours</b>
<b>01</b>	<b>Introduction to Machine Tools</b>			
	1.1 Classification of manufacturing processes according to continuous and intermittent manufacturing, classification of machining processes according to chip formation, abrasive machining and non-conventional processes, Classification of machine tools according to desired purpose, size of chip removed, degree of automation, weight.	---	Definition, need of non-conventional machining processes(017103503-Unit-1.1) Part classification and coding systems (017103503-Unit-6.3) Introduction to additive manufacturing, need of additive manufacturing, advantages of additive manufacturing.(017103503-Unit-9.1)	<b>3 (7.5%)</b>
	1.2 Metal cutting processes like turning, facing, drilling, boring, milling, shaping, planning and slotting.	---	NC and CNC technology: types, classification (017103503-Unit-04)	
	1.3 Super finishing processes like grinding, lapping, honing, buffing,	---	---	

	barrel tumbling, burnishing, powder coating and polishing.			
	1.4 Basic machining and tool motion such as primary motion, feed motion and auxiliary motion.	---	---	
	1.5 Cutting tool materials.	---	---	
	<b>Theory of Metal Cutting</b>			
02	2.1 Nomenclature of single point cutting tool as per A.S.A and O.R.S method, Geometry and important terms of single point cutting tool.	Concept of front view, top view and side views (017102293-Unit-07)	---	5 (12.5 %)
	2.2 Methods of machining and mechanism of chip formation using chip thickness ratio and velocity relationship.	---	---	
	2.3 Merchant circle theory and its relationship with force, shear angle and velocity, Numerical.	Laws of sines and cosines (017101191-Unit-02), Stress and Strain concept (017103391-Unit- 01)	---	
	2.4 Tool life and factors affecting tool life, Numerical.	Friction (017102291-Unit-07)	---	
	<b>Metal Cutting Lathes</b>			
03	3.1 Working principle of lathe machine.	Demonstration of job on Lathe machine (017102193-Unit-1.1)	---	7 (17.5 %)
	3.2 Construction of lathe machine and size of lathe machine.	---	---	
	3.3 Types of lathe like bench lathe, speed lathe, engine lathe, tool room lathe, capstan & turret lathe and automatic lathe.	---	---	
	3.4 Types of Headstock like all geared headstock and backgear cone and pulley type headstock.	---	---	
	3.5 Feed mechanism like end gear mechanism, feed gear mechanism, feed rod & lead screw and apron mechanism.	---	---	
	3.6 Lathe operations like turning, facing, knurling, chamfering, drilling, grooving, profiling, forming and boring.	---	Part programming of turning centre (017103503-Unit-5.4)	
	3.7 Taper turning methods like Tail stock set over method, swiveling compound rest method, taper turning attachment, form tool method, thread cutting set up and mechanism on lathe and thread chasing.	---	---	
	3.8 Lathe accessories like lathe centres, chucks, angle plate, face plate, lathe dog, mandrels, steady and follower rest.	---	---	

	3.9 Machining time calculations.	---	---	
04	<b>Capstan and Turret Lathe</b>			2 (5%)
	4.1 Construction and working of Capstan lathe.	Types of lathe like bench lathe, speed lathe, engine lathe, tool room lathe, capstan & turret lathe and automatic lathe.(017103302- Unit-3.3)	---	
	4.2 Construction and working of Turret lathe.			
	4.3 Comparison between capstan and turret lathe.	---	---	
	4.4 Turret indexing mechanism .	---	---	
05	<b>Boring Machines</b>			1 (2.5% )
	5.1 Working principle of boring machine.	---	---	
	5.2 Construction and working of Horizontal boring machine.	---	---	
	5.3 Construction and working of Vertical boring machine.	---	---	
	5.4 Construction and working of Jig boring machine.	---	---	
06	<b>Drilling Machines</b>			4 (10%)
	6.1 Working principle of drilling machine.	Demonstration of job on Drilling machine (017102193-Unit-1.2)	---	
	6.2 Classification of According to Types of Shank, flute, length of drill, applications and material of tool.	---	---	
	6.3 Types of drilling machine like Portable, Sensitive, Upright, Radial , Deep hole ,Gang, Multiple spindle and Automatic drilling machine .	---	---	
	6.4 Nomenclature and geometry of twist drill.	Concept of front view, top view and side view (017102293- Unit-07)	---	
	6.5 Drilling operations like Drilling, Boring, Reaming, Counter Boring, Counter Sinking, Spot facing, Tapping, Trepanning.	---	---	
	6.6 Tool holding device like chuck, sleeves and sockets.	---	---	
	6.7 Machining time calculations.	---	---	
07	<b>Milling Machines</b>			8 (20%)
	7.1 Working principle of milling machine and parts of column and knee type milling machine.	Demonstration of job on Milling machine (017102193-Unit-1.3)	---	
	7.2 Types of column and knee type milling machine such as hand milling, plain milling, vertical milling,	---	---	

	universal and omniversal milling machines, Difference between plain and universal milling machine.			
	7.3 Milling cutter terminology.	---	---	
	7.4 Types of milling cutters such as Plain, Side, Metal slitting saw, Angle, End mill cutter, T-slot milling cutter, Wood ruff key slot milling cutter, Fly cutter, Formed cutter.	---	Part programming of machining centre.(017103503-Unit-5.5)	
	7.5 Work holding devices such as T – slots, Angle plates, V-blocks and vices.	---	---	
	7.6 Milling methods such as Up milling and Down milling.	---	---	
	7.7 Milling operations – Plain, face, angular, form, straddle, gang, slot & groove, keyway, slitting, side, end, profile, gear, thread, helical and cam milling.	---	---	
	7.8 Indexing mechanism, Indexing head such as plain, universal and optical dividing head.	Classification of gears (017103392-Unit-05)	---	
	7.9 Indexing methods such as direct indexing, simple indexing, compound indexing and differential indexing and its numericals.	---	---	
	7.10 Milling machine attachments such as vertical, universal, high speed, rack, gear cutting, rotary table and indexing head.	---	---	
	7.11 Machining time calculations.	---	---	
	<b>Alignment Test of Machine Tools</b>			
08	8.1 Alignment test of lathe machine.	Construction of lathe machine and size of lathe machine. (017103302- Unit-3.2)	---	1 (2.5%)
	8.2 Alignment test of milling machine.	Working principle of milling machine and parts of column and knee type milling machine. (017103302-Unit-7.1)	---	
	8.3 Alignment test of drilling machine.	Working principle of drilling machine. (017103302- Unit-6.1)	---	
	<b>Shaper, Planar and Slotter Machines</b>			
09	9.1 Working principle of shaper, planar and slotter machine.	---	---	4 (10%)
	9.2 Construction of shaper and slotter machine.	---	---	
	9.3 Mechanism of shaper machines such as Crank and Slotted Quick return	Quick return mechanism (017103392-Unit-02)	---	

	mechanism, Whitworth quick return mechanism, Hydraulic Mechanism.			
	9.4 Construction of planar machine.	---	---	
	9.5 Operations of shaper, planar and slotter machine such as machining of horizontal, vertical, angular, irregular surfaces and cutting slots, grooves and key ways.	---	---	
	9.6 Machining time calculations.	---	---	
	<b>Grinding Machines</b>			
<b>10</b>	10.1 Working principle of grinding machine.	Demonstration of job on Grinding machine (017102193-Unit-1.4)	---	<b>5 (12.5%)</b>
	10.2 Types of grinding machines such as bench, swing frame, belt grinders, cylindrical, universal cylindrical, centerless grinder, surface, plain internal, planetary internal, centerless internal grinding machines.	---	---	
	10.3 Grinding wheel designation.	---	---	
	10.4 Mounting of grinding wheel and dressing, truing and glazing.	---	---	

<b>Sr No.</b>	<b>Practical Title</b>	<b>Link to Theory Syllabus</b>
<b>1</b>	To perform facing, turning and knurling operation on lathe machine	Unit-3
<b>2</b>	To perform taper-turning and grooving operation on lathe machine	Unit-3
<b>3</b>	To perform drilling, threading and chamfering operation on lathe machine	Unit-3
<b>4</b>	To perform drilling operation on sensitive drilling machine	Unit-6
<b>5</b>	To perform drilling operation on radial drilling machine	Unit-6
<b>6</b>	To manufacture spur gear using milling machine	Unit-7
<b>7</b>	To manufacture diamond block using universal milling machine	Unit-7
<b>8</b>	To perform machining on horizontal surface using shaper machine	Unit-9
<b>9</b>	To perform grinding operation on grinding machine	Unit-10

<b>Major Components/ Equipment</b>	
<b>Sr. No.</b>	<b>Component/Equipment</b>
1	Lathe machine
2	Horizontal Milling machine & universal milling machine
3	Sensitive drilling machine & radial drilling machine
4	Shaper machine
5	Grinding machine

**Proposed Theory + Practical Evaluation Scheme by Academicians  
(% Weightage Category Wise and it's Marks Distribution)**

**L :** 3      **T:** 1      **P:** 2

**Note: In Theory Group, Total 4 Test (T1+T2+T3+T4) will be conducted for each subject.**

**Each Test will be of 25 Marks.**

**Each Test Syllabus Weightage: Range should be 20% - 30%**

Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage	
Theory	4	5	MCQ	52%	65	
Theory			Theory Descriptive (Mainly Programming)	16%	20	
Theory			Formulas and Derivation	0%	0	
Theory			Numerical	12%	15	
<b>Expected Theory %</b>	<b>80%</b>			<b>Calculated Theory %</b>	<b>80%</b>	<b>100</b>
Practical	1		Individual Project	0%	0	
Practical			Group Project	8%	40	
Practical			Internal Practical Evaluation (IPE)	12%	60	
Practical			Viva	0%	0	
Practical			Seminar	0%	0	
<b>Expected Practical %</b>	<b>20%</b>		<b>Calculated Practical %</b>	<b>20%</b>	<b>100</b>	
<b>Overall %</b>	<b>100%</b>			<b>100%</b>	<b>200</b>	

**Course Outcome**

*Upon completion of the course students will be able to*

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|---|---|
| 1 | Understand the concept of machining, various machine tool and analyze the various forces acting during machining.   |
| 2 | Study, understand and distinguish the sequence of machining operation to produce the end product and also study different parts of lathe and boring machine.          |
| 3 | Identify basic parts and operations of machine tools included in drilling and milling machines.   |
| 4 | Design proper devices to align a machine and also distinguish the working principles of various operations performed in grinding, shaper, planer and slotter machine. |

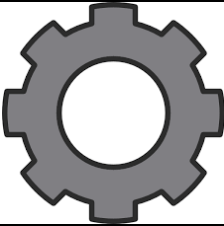




**Suggested Reference Books**


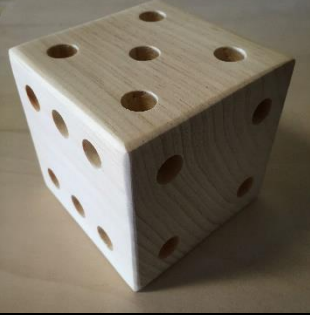


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|---|--|
| 1 | Production Technology, R. K. Jain  |
| 2 | A Text Book of Production Engineering, by P C Sharma, S Chand Publication.           |
| 3 | Workshop Technology (Manufacturing Processes) by S K Garg, University science press. |
| 4 | Manufacturing Processes, O.P. Khanna.  |

## List of Open Source Software/Learning website

1 <http://nptel.ac.in/>

### Practical Project/Hands on Project

Sr. No.	Project List		Linked with Unit
1	Manufacture a gear of 8 teeth using suitable methods and machine tools.		Unit 07
2	Take a rectangular shape sample and generate four step structure on it using suitable machine and cutting tools.		Unit 09
3	Sharpen cutting tip of single point cutting tool.		Unit 10
4	Prepare a tensile specimen on lathe machine		Unit 03
5	Prepare drainage cover for bathroom using suitable method		Unit 06

6	Prepare bullet shape model on lathe machine.		Unit 03
7	Prepare a dice using drilling machine		Unit 06
8	Prepare key and keyways		Unit 09
9	Prepare a hexagon gear		Unit 07