Program : **Diploma inMechanical Engineering/Manufacturing Technology**	
Course Code :**3023**	Course Title: **Machine Tools**
Semester : **3 / 3**	Credits: **4**
Course Category: **Program Core**	
Periods per week: **4 (L:3,T:1,P:0)**	Periods per semester:**60**

CourseObjectives:

- To familiarize the concept and basic mechanics of metal cutting
- To familiarize the working of standard machine tools such as lathe, shaping, planning, milling, slotting, drilling and allied machine tools
- To introduce the basic concepts of NC and CNC machines.

Course Prerequisites:

Topic	Course Code	Course Name	Semester
Basic manufacturing operations performed in industries		Engineering workshop practice	1&2
Introduction to manufacturing processes		Manufacturing Technology	2

Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive Level
CO1	Describe the concept of mechanics of metal cutting in manufacturing operations and explain lathe machinery, its parts with various operations performed in it.	15	Understanding
CO2	Summarize drilling, shaper, planer, and slotting machines including its parts, various operations performed in each and specifications of each machine tool.	14	Understanding

CO3	Describe the significance of milling, grinding machines (types, parts cutting tools, operations performed) and other super finishing operations.	15	Understanding
CO4	Explain the principle of NC and CNC machines and significance of lubricants/cutting fluids used in machining process.	14	Understanding
	Series Test	2	

CO – PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2		2				
CO2	2						
CO3	2						
CO4	2						2

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline

ModuleOutcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Describe the concept of mechanics of metal cutting in manufacturing operations and explain lathe machinery, its parts with various operations performed in it.**		
M1.01	Compare orthogonal and oblique cutting process	1	Understanding
M1.02	Identify the nomenclature of single point cutting tool and understand the properties of cutting tool materials	2	Understanding
M1.03	Solve simple tool life problems using Taylor's Equation	2	Applying
M1.04	Explain the classification and parts of a lathe machine with specifications.	5	Understanding
M1.05	Explain the types of operations that can be performed in a lathe	5	Understanding
Contents: Metal cutting: Orthogonal cutting and oblique cutting- chip formation -type of chips- cutting speed feed and depth of cut - tool signature/ nomenclature of the single point cutting tool- State the properties of various cutting tool materials- tool life problems- machinability.			

Lathe machine and operations: Type of lathe – Centre lathe- Tool room lathe- Bench lathe and Speed lathe. Lathe construction – lathe parts- function of each part - Lathe accessories – work holding and tool holding devices. Metal cutting – speeds- feeds and depths of cut of different operation for different materials- Operations – cylindrical turning - taper turning methods- thread cutting- Lathe specification.			
CO2	**Explain shaper, planer, drilling and slotting machines including its parts, various operations performed in each and specifications of each machine tools.**		
M2.01	Explain the classification, parts and mechanisms of a shaper and planar (parts and specification only) machines	5	Understanding
M2.02	Compare shaper and planning machines	1	Understanding
M2.03	Explain the classification, parts and specification of drilling machines	3	Understanding
M2.04	Explain drilling tools/reamers used in drilling process and various operations performed in drilling machines	3	Understanding
M2.05	Explain the uses, parts, functions and specifications of a slotting machine	2	Understanding
	Series Test – I	1	
Contents: Drilling: Classification; Basic parts and their functions; Radial drilling machine; Types of operations; Specifications of drilling machine; Types of drills and reamers. Shaping Machines- shaper-use – parts and their functions – shaper tool holding devices- Quick return motion - arrangements and adjustments of stroke- crank and slotted lever method (Detailed explanation of crank and slotted lever and listing of other types of mechanisms)-Whitworths method- Hydraulic method- automatic feed mechanism- speed-feed and depth of cut -Shaper specifications. Planning machines- parts, specification, comparison with shaper Slotting Machines- slotter use- Slotter parts and their functions- Tools and work holding devices -specifications.			
CO3	**Describe the significance of milling & grinding machines (types, parts, cutting tools, operations performed) and other super finishing operations.**		
M3.01	Comprehend milling process types, specifications	3	Understanding
M3.02	Discuss the various types of milling cutters used in milling machines	1	Understanding
M3.03	Explain about tool and work holding devices in milling machines	2	Understanding
M3.04	Explain the grinding process, types, tools and principle of material removal.	5	Understanding
M3.05	Explain various super finishing process used for	4	Understanding

	various applications		

Contents:
Milling: Introduction; Types of milling machines and parts only: plain, Universal, vertical; specifications; Up milling and Down milling; Milling operations: simple, compound and differential indexing; Milling cutters – types; Nomenclature of teeth; Teeth materials; Tool signature of milling cutter; Tool & work holding devices.

Grinding and finishing processes: Types, Principles of metal removal by Grinding; Abrasives –Natural & Artificial; Bonds and binding processes (List of different materials only): Vitrified, silicate, shellac, rubber, Bakelite; Factors affecting the selection of grind wheels: Principle of centerless grinding; Advantages & limitations of center less grinding; Finishing by grinding: Honing, Lapping, Super finishing.

CO4	**Explain the principle of NC and CNC machines and significance of lubricants/cutting fluids used in machining process.**		
M 4.01	Explain the principle of NC and CNC machines	3	Understanding
M 4.02	Discuss about the components, processes, classification and tool system of NC and CNC machines	4	Understanding
M 4.03	Compare NC and CNC machines	2	Understanding
M 4.04	Explain the significance of cutting fluids/lubricants used in machining	3	Understanding
M 4.05	Describe the properties and application of lubricants	2	Understanding
	Series Test – II	1	

Contents:
NC &CNC Machines-Basic concepts of NC and CNC machines-Introduction- construction details – classification: motion type, control loop system, axis- Components and their functions-Automatic tool changer - tool magazine - comparison of NC and CNC machines.
Cutting Fluids & Lubricants: Introduction; Types of cutting fluids, Fluids and coolants required in turning, drilling, shaping, sawing & broaching; Selection of cutting fluids, methods of application of cutting fluid; Classification of lubricants (solid, liquid, gaseous), Properties and applications of lubricants.

Text / Reference

T/R	Book Title/Author
T1	Workshop Technology- WAJ Chapman - Volume I, II, & III – Vima Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
R1	Production Technology – HMT - Edn. 18 - published by Tata McGraw Hill

	publishing Co. Ltd., 7 West Patel nagar, New Delhi 110 008. – 2001.
R2	Production Technology - P. C. SHARMA - Edn. X - S.Chand& Co. Ltd., Ram Nagar, New Delhi 110 055 - 2006
R3	Production Technology, Edn. XII, Khanna Publishers, 2-B, North Market, NAI Sarak, New Delhi 110 006 - 2006
R4	Production Technology by R.K.Jain.

Online Resources

Sl.No	Website Link
1	https://nptel.ac.in/courses/112107145/
2	https://nptel.ac.in/courses/112104196/