

## Manufacturing Processes - II

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### Course Objectives:

- Explain parameters in the metal cutting operation.
- Relate tool wear and tool life and the variables that control them.
- Calculate machining times for different machining processes.
- Teach various metal cutting processes. (Lathe, drilling, boring shaping, slotting, milling and grinding).
- Familiarize the principles of jigs and fixtures and types of clamping and work holding devices.

### UNIT I:

**8 Hours**

#### Material Removal Processes:

**Metal Cutting:** Single and multi-point cutting, orthogonal cutting, various force components, chip formation, tool wear and tool life, surface finish and integrity, machinability, cutting tool materials, cutting fluids, coatings.

#### Learning Outcomes:

At the end of the this unit, the student will be able to

- Describe cutting processes and variables. (L2)
- Classify various types of chips, cutting tool materials and cutting fluids. (L4)
- Calculate cutting force, speed and feed finding techniques during machining. (L5)

### UNIT II:

**10 Hours**

#### Machining processes for round shapes:

**Lathe and Lathe Operations:** Principles of working, specifications, types of lathes, operations performed, work holders and tool holders. Taper turning, thread turning attachments for lathes. Machining time calculations. Turret and capstan lathes – Principle of working, collect chucks, other work holders – toolholding devices.

**Boring and Boring Machines-** Principles of working, specifications, types, and operations performed – toolholding devices – nomenclature of boring tools

**Drilling and Drilling Machines:** Principles of working, specifications, types, and operations performed – toolholding devices – nomenclature of twist drill.

**Reaming and Reamers:** Principles of working, specifications, types, and operations performed – toolholding devices – nomenclature of reamers.

**Taping and Taps:** Principles of working, specifications, types, and operations performed – toolholding

devices – nomenclature of taps.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- List the specifications for various types of lathes. (L1)
- Determine cutting speeds for different machining operations. (L5)
- Identify parts of drilling, boring, reaming machines. (L3)

**UNIT III:**

**8 Hours**

**Machining processes for other shapes:**

**Milling operations and Milling machines:** Principles of working, specifications, classifications of milling machines, machining operations, types and geometry of milling cutters, methods of indexing, and accessories to milling machines, machining time calculations, gear hobbing.

**Shaping, Slotting and planing machines:** Principles of working – principal parts, specification, classification, and operations performed, machining time calculations.

**Gear Manufacturing:**

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Recognize the parts of milling, shaping, slotting and planing machine. (L3)
- Compare tool geometry for milling, shaping, slotting and planing operations. (L3)
- Calculate machining times. (L5)

**UNIT IV:**

**8 Hours**

**Abrasive Machining:**

**Grinding and Grinding Machines:** Grinding process, types of grinding machines, grinding process parameters, honing, lapping, other finishing processes.

**Learning Outcomes:**

- At the end of this unit, the student will be able to
- Understand the basic principles of abrasive processes. (L2)
- Explain the designation of the grinding wheel and the significance of the various codes. (L2)
- Classify different types of grinding machines and their applications. (L4)
- Assess the grinding process and variables that effect the operation. (L5)
- Estimate the time and power required for the grinding operation. (L5)
- Explain various types of abrasive processes such as honing and lapping for final finishing operation. (L2)



**UNIT V:****8Hours**

**Jigs and Fixtures** Principles of design of Jigs and fixtures and uses, 3-2-1 principle of location and clamping, classification of Jigs & Fixtures, types of clamping and work holding devices, typical examples of jigs and fixtures.

**Learning Outcomes:**

At the end of this unit, the student will be able to

- Classify various types of jigs and fixtures. (L4)
- Identify various types of work and tool holding devices. (L3)
- Explain the design principles of jigs and fixtures. (L2)
- Design a jig and fixture for a given application. (L6)

**Text books:**

1. P.N. Rao, Manufacturing Technology: Metal Cutting and Machine Tools, (Volume 2), 3/e, Tata McGraw-Hill Education, 2013
2. R.K. Jain and S.C. Gupta, Production Technology, 17/e, Khanna Publishers, 2012.

**Reference books:**

1. Kalpakzian S and Schmid SR, Manufacturing Engineering and Technology, 7/e, Pearson, 2018.
2. Milton C. Shaw, Metal Cutting Principles, 2/e, Oxford, 2012.
3. Hindustan Machine Tools, Production Technology, TMH, 2001.
4. V.K. Jain, Advanced Machining Process, 12/e, Allied Publications, 2010.
5. AB. Chattopadhyay, Machining and Machine Tools, 2/e, Wiley, 2017.
6. Halmi A Yousuf & Hassan, Machine Technology: Machine Tools and Operations, CRC Press Taylor and Francis Group, 2008.

**Course Outcomes:**

At the end of the course, the student will be able to

- Choose cutting processes and variables. (L3)
- Relate tool wear and tool life. (L1)
- Calculate the machining parameters for different machining processes. (L5)
- Identify methods to generate different types of surfaces. (L3)
- Explain work-holding requirements. (L2)
- Design jigs and fixtures. (L6)