

SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35.

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DEPARTMENT OF AUTOMOBILE ENGINEERING

23GET102 – BASIC CIVIL MECHANICAL ENGINEERING

I YEAR / I SEMESTER

UNIT 3 - OVERVIEW OF MECHANICAL ENGINEERING

Topic : Lathe and its Types



Manufacturing Process Overview

A manufacturing process involves the systematic conversion of raw materials into finished products through controlled operations and techniques.



Material Removal

Controlled subtraction of excess material using cutting, grinding, or machining operations



Assembly & Joining

Combining multiple components through welding, fastening, or bonding techniques



Finishing Process

Surface treatment and refinement to achieve desired texture, appearance, and quality



Material Removal Operations

Material removal operations involve the controlled elimination of excess material from a workpiece to achieve precise dimensions and desired product specifications.

Small Scale Operations

- Manual fitting work
- Craftwork and fine detailing
- Tool and die making
- Prototype development

Large Scale Operations

- Industrial mass production
- Automotive manufacturing
- Aerospace components
- Heavy machinery fabrication



Understanding Tools in Manufacturing

A tool is any device employed to carry out manufacturing operations, ranging from simple hand-operated implements to sophisticated powered machinery.



01

Hand Tools

Manually operated devices powered by human effort

02

Machine Tools

Power-driven equipment for precision machining operations

Types of Tools in Detail

Hand Tools

Tools operated manually by human effort, providing direct control and precision for detailed work.

- Files for smoothing and shaping
- Hacksaws for cutting operations
- Hammers and chisels



Machine Tools

Power-driven machines that accomplish cutting operations with enhanced speed, accuracy, and repeatability.

- Lathes for cylindrical work
- Milling machines
- Drilling equipment

Introduction to the Lathe

A lathe is a fundamental machine tool employed primarily to produce circular and cylindrical objects through rotational cutting operations.



Drilling

Creating holes in workpieces



Grinding

Achieving smooth finishes



Shaping

Forming desired contours



Milling

Removing material precisely



Classification of Lathe Machines

Lathes are classified based on their design, functionality, and level of automation to suit various manufacturing requirements.

1 **Engine Lathe (Center Lathe)**
General-purpose lathe for a wide range of operations with manual control

2 **Speed Lathe**
High-speed operation for light work like polishing and wood turning

3 **Turret Lathe**
Multiple tool positions for efficient production work

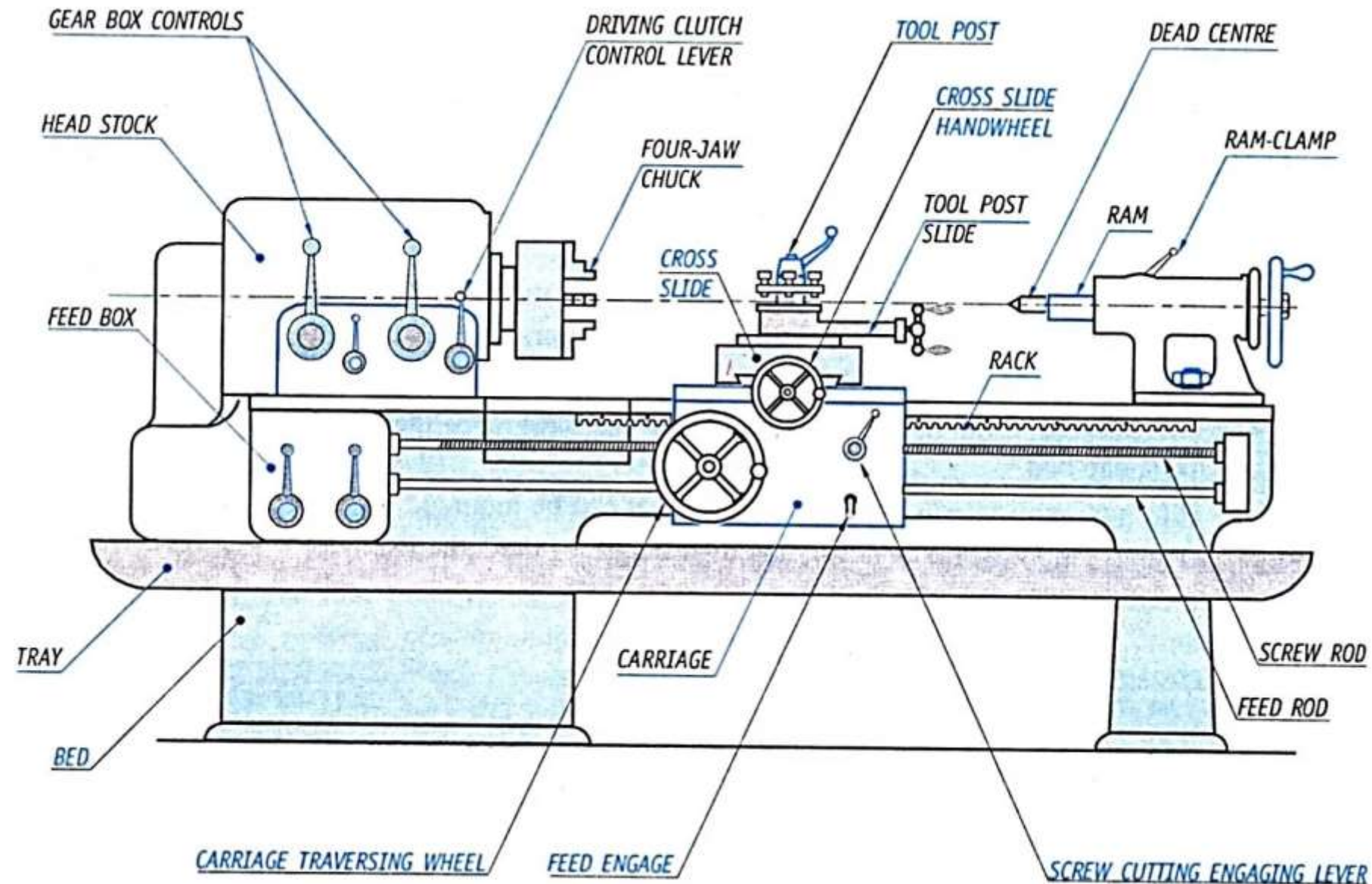
4 **Capstan Lathe**
Hexagonal turret for quick tool changes in batch production

5 **Automatic Lathe**
Fully automated operation for high-volume manufacturing

6 **CNC Lathe**
Computer-controlled precision machining with programmable operations

Lathe Working Principle

"A cutting tool can remove chips from rotating workpieces to produce circular objects"



Lathe Working Principle

"A cutting tool can remove chips from rotating workpieces to produce circular objects"

The lathe operates on a fundamental principle where the workpiece rotates at high speed while a stationary cutting tool removes material progressively.

- Workpiece mounted in chuck rotates continuously
- Cutting tool remains stationary or moves linearly
- Material removed as chips through controlled contact
- Cylindrical shapes produced through rotational symmetry

The Chuck and Cutting Action

Chuck Function

The chuck is a critical work-holding device that securely grips the workpiece and rotates it at precise speeds.

01

Secure Mounting

Chuck firmly holds the workpiece in place

02

High-Speed Rotation

Workpiece spins at controlled velocities

03

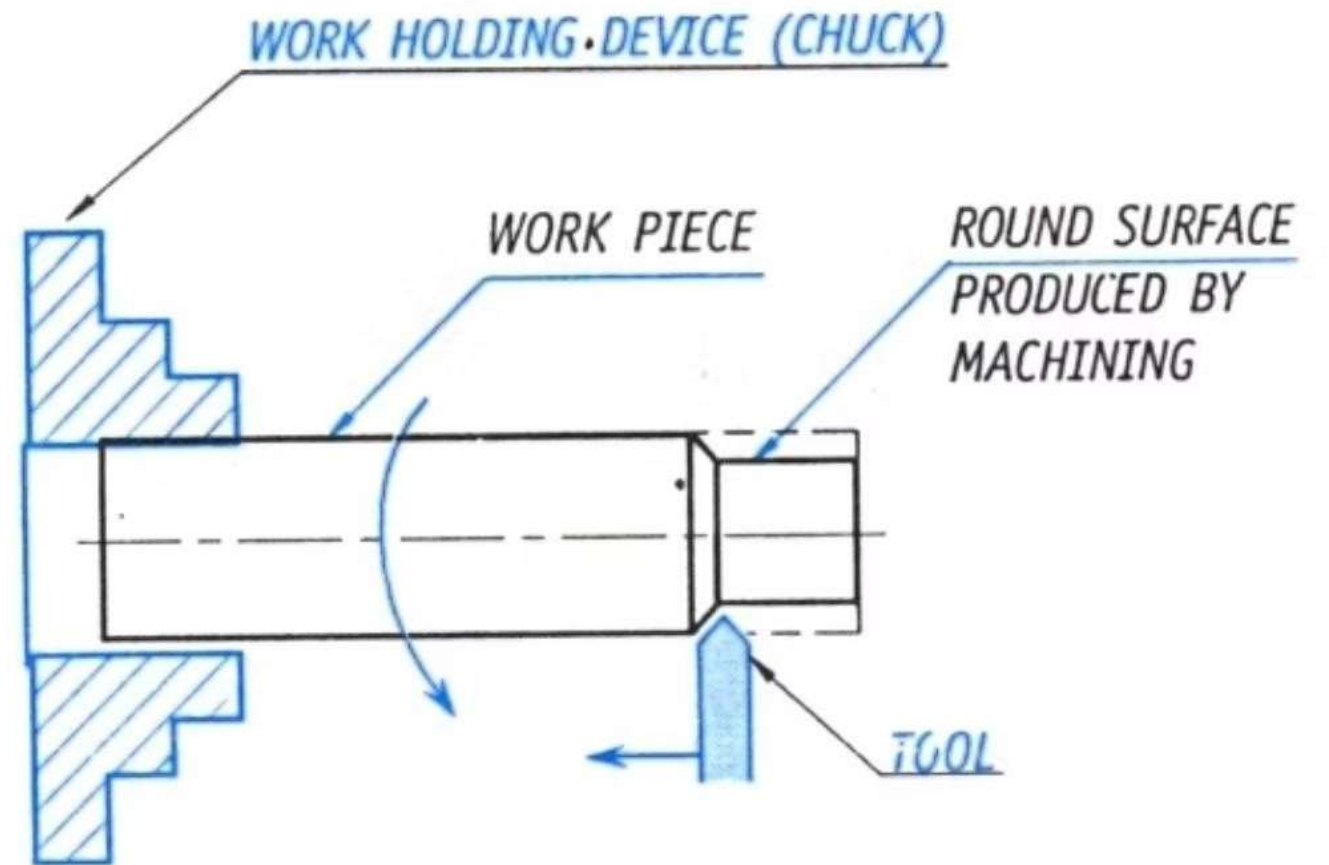
Tool Engagement

V-shaped cutting tool contacts rotating surface

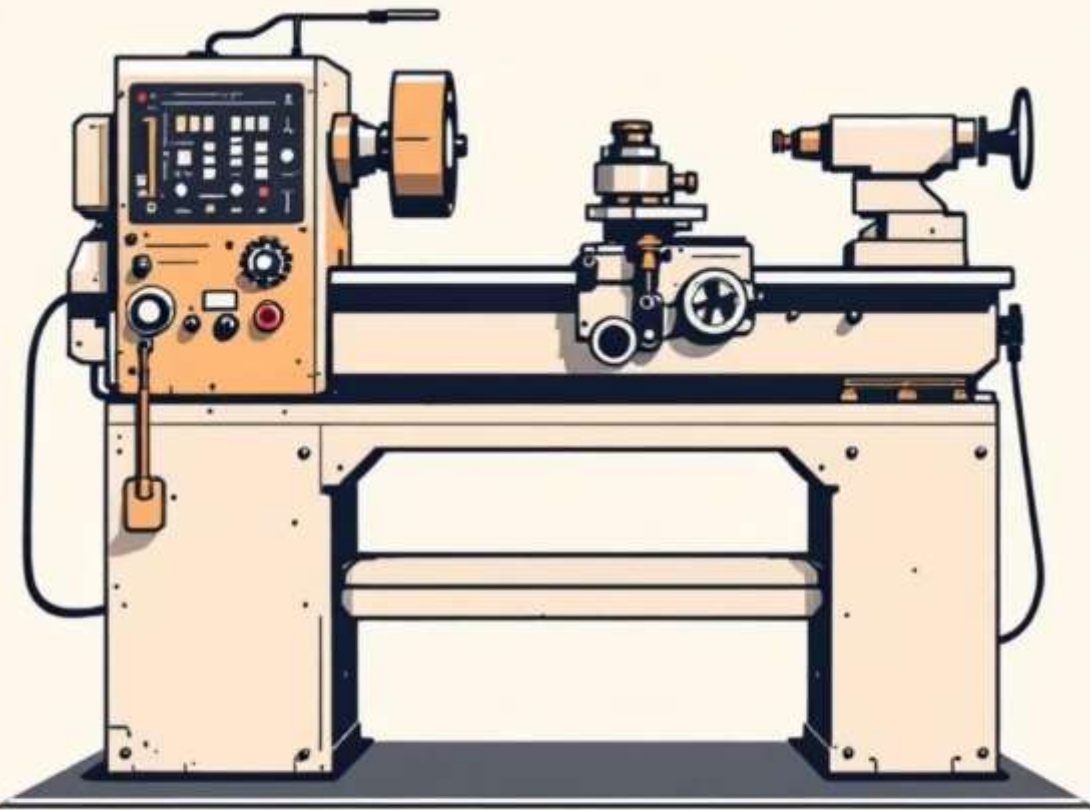
04

Material Removal

Tool moves parallel to axis, removing material



Major Components of a Lathe



Bed

The foundation of the lathe that supports all components. Features precision-machined guide ways on top for accurate movement.



Headstock

Houses the main spindle, feed gearbox, and cone pulley. Rigidly mounted on the bed to ensure stability during operations.



Saddle

H-shaped casting that slides over the guide ways, serving as the base for the cross slide and tool post assembly.

These components work in harmony to provide the precise control and stability required for accurate machining operations.