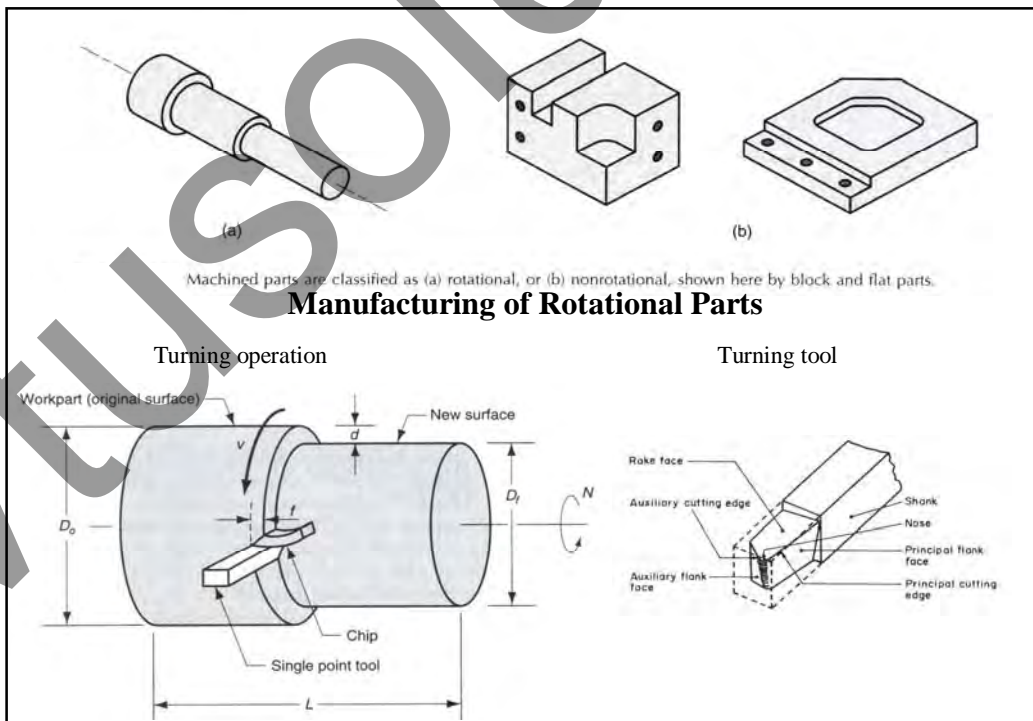
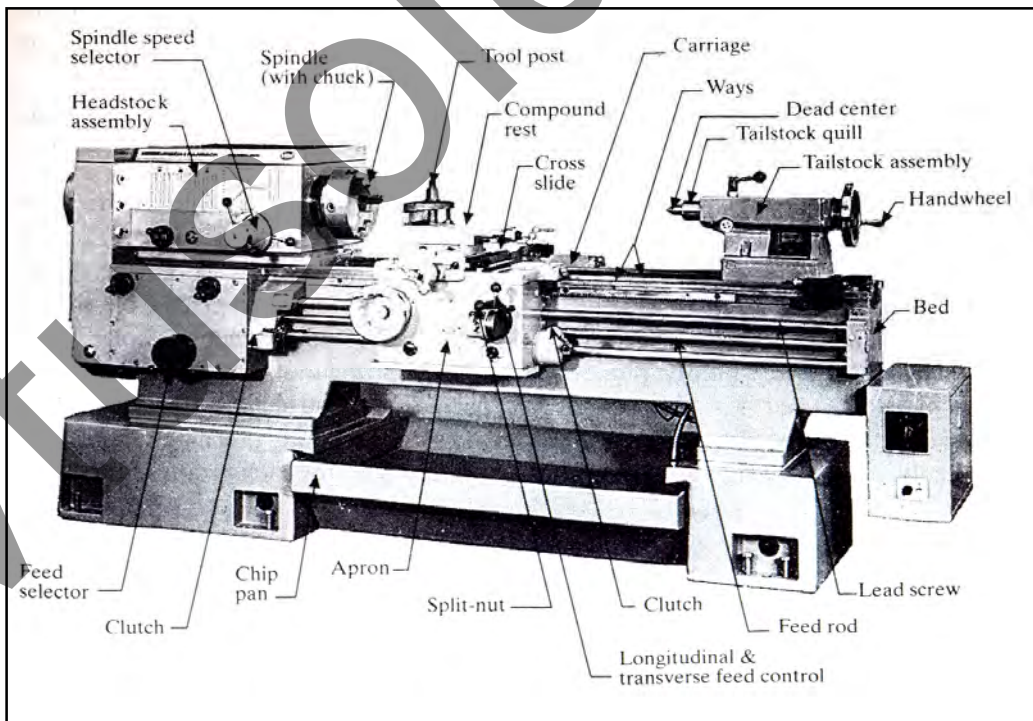
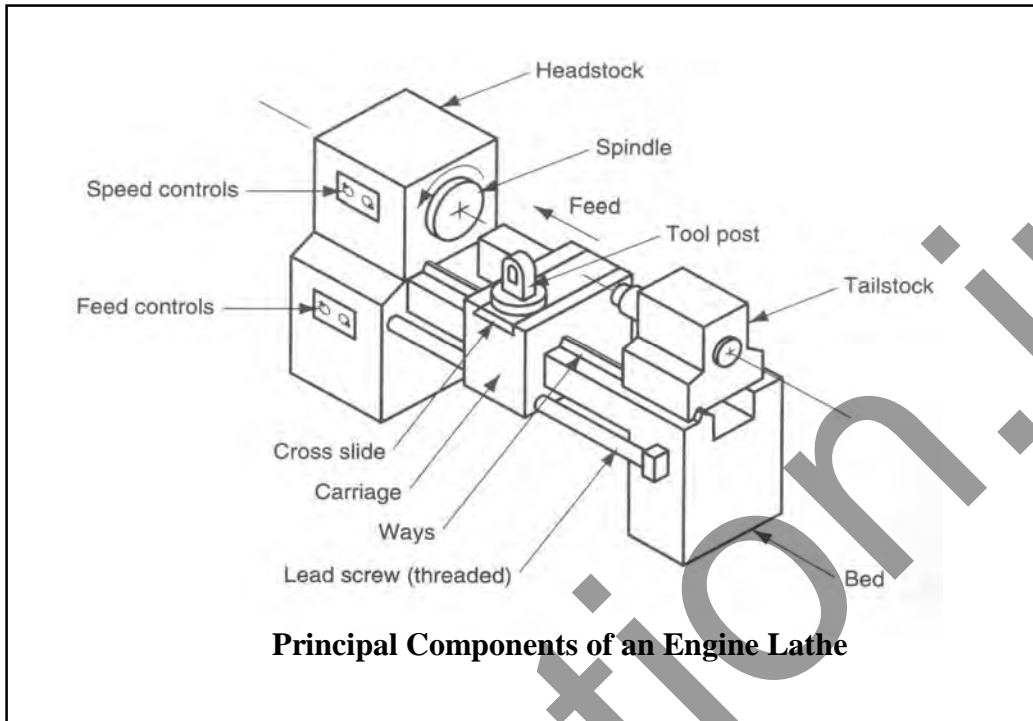


# Machining Operations and Machine Tools

Dr. Pulak M. Pandey

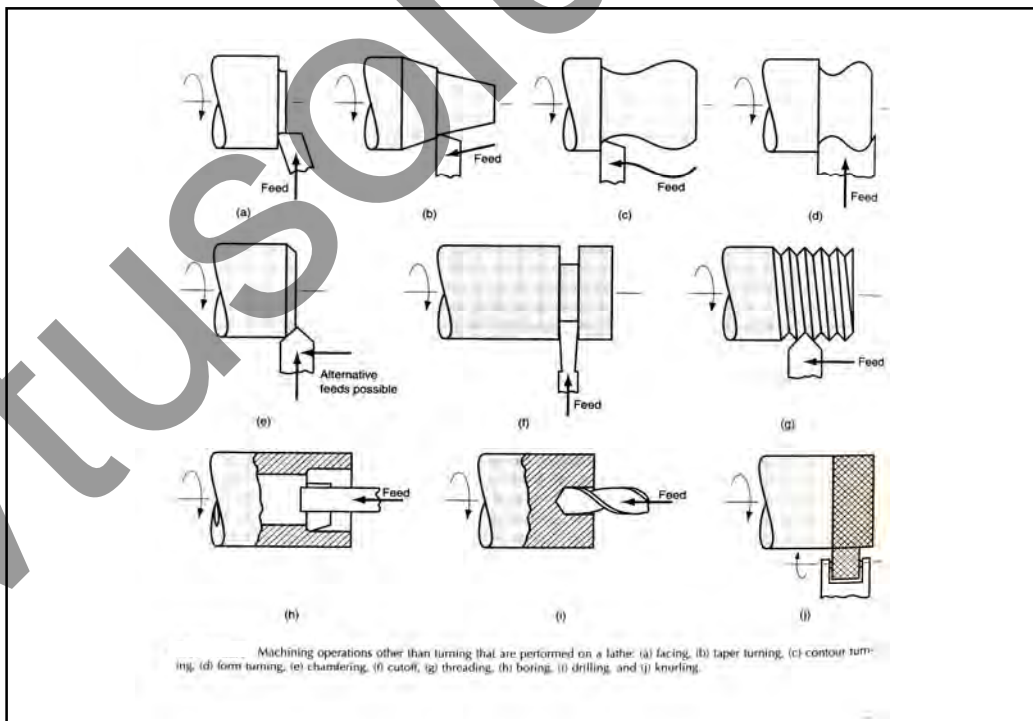
<http://paniit.iitd.ac.in/~pmpandey>



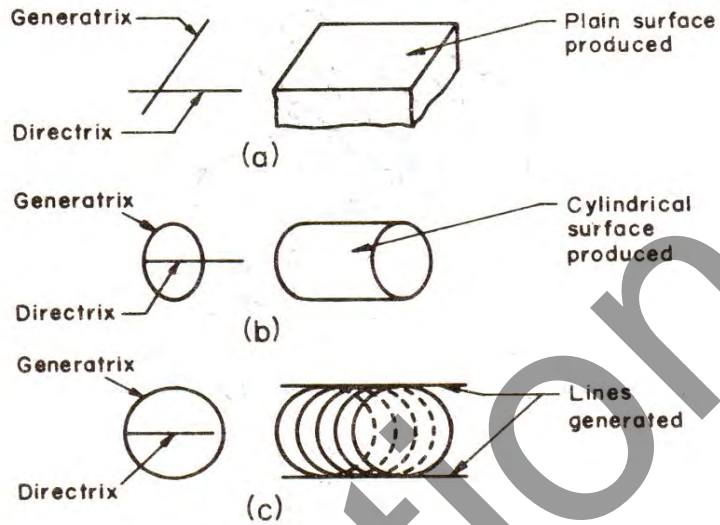


## Various types of Lathe Machine Tools

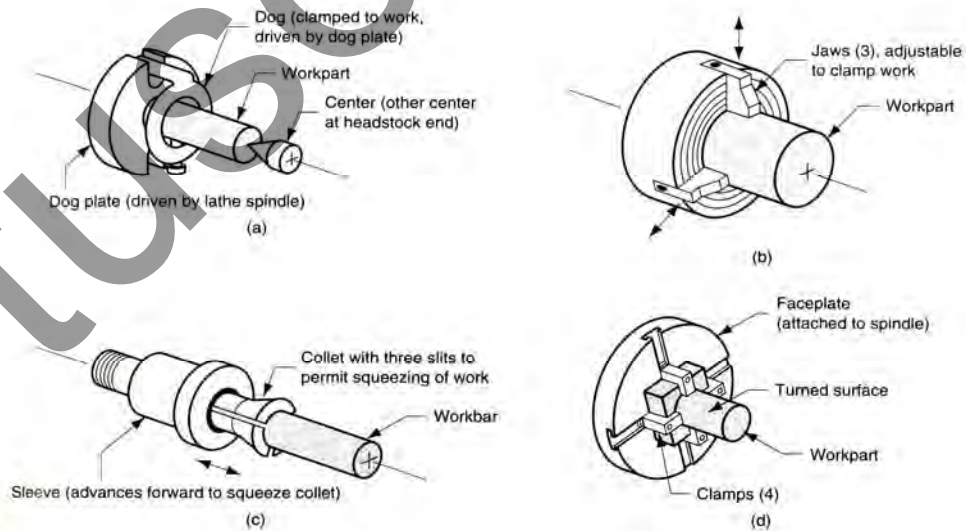
- Engine lathe
- Tool room lathe
- Speed lathe
- Turret lathe
- Chucking lathe
- Automatic screw machine or a bar machine
- Numerically controlled lathe

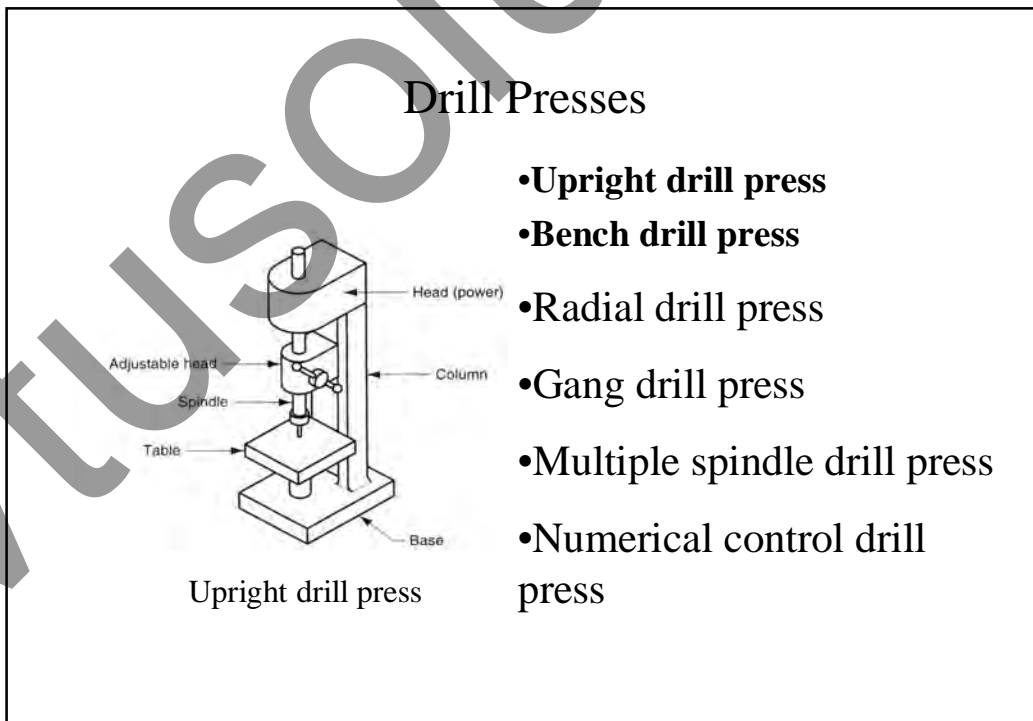
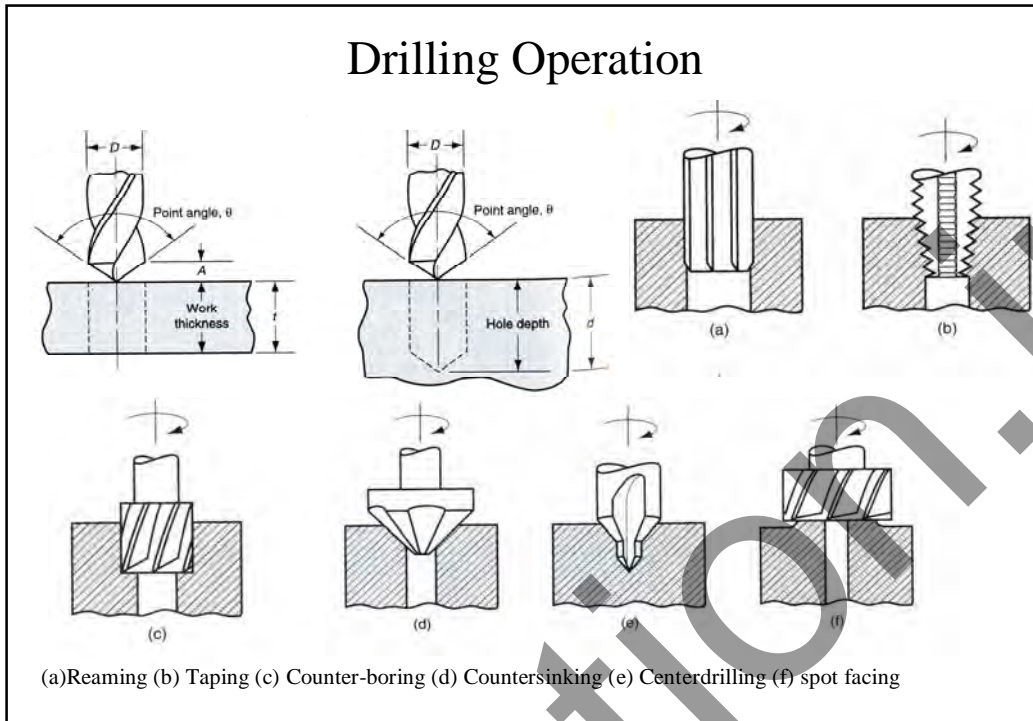


### Concept of generatrix and directrix

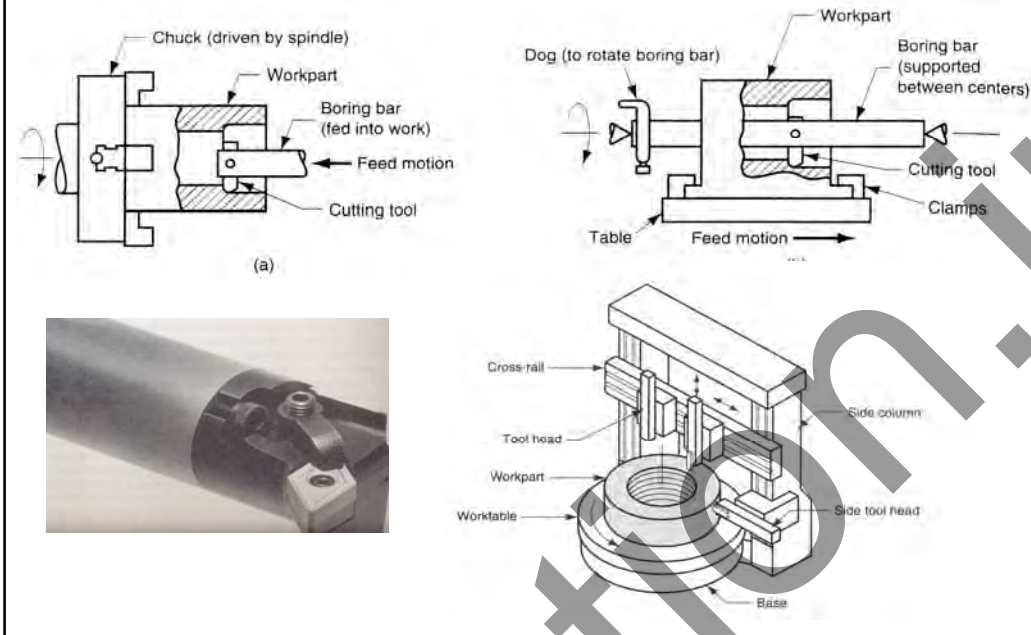


### Workholding Methods in Lathe

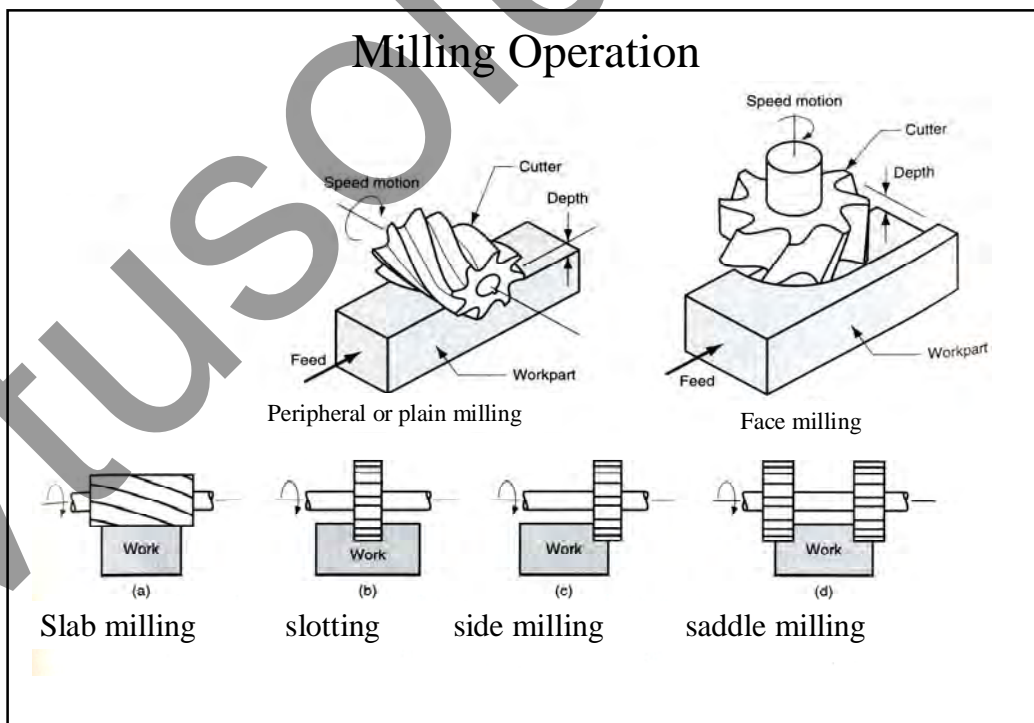


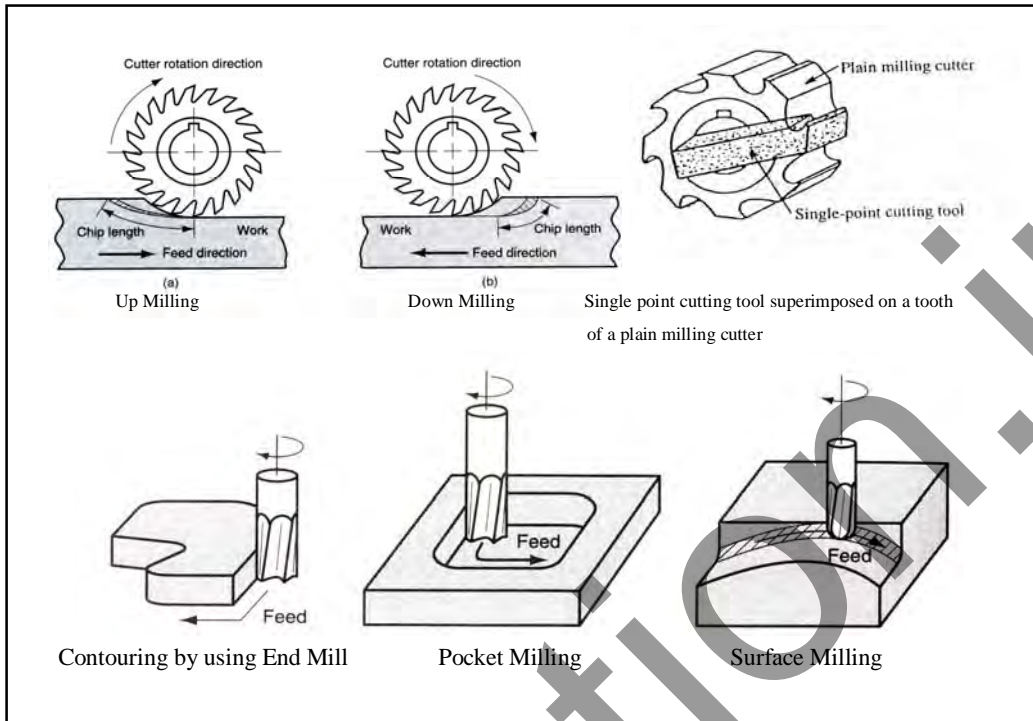


## Boring Operation

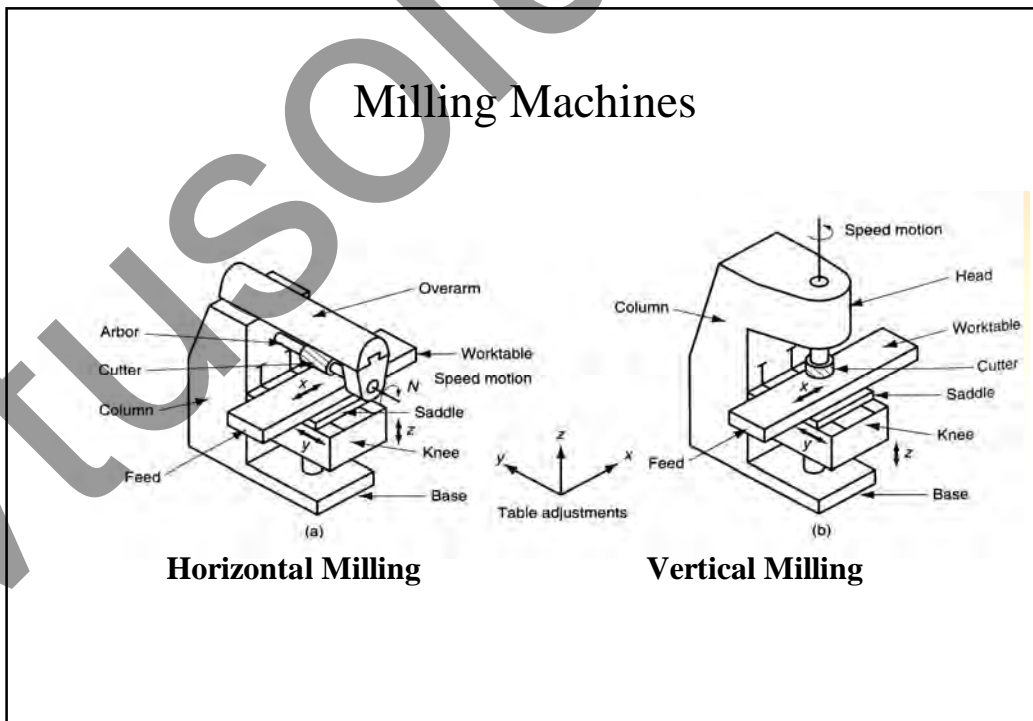


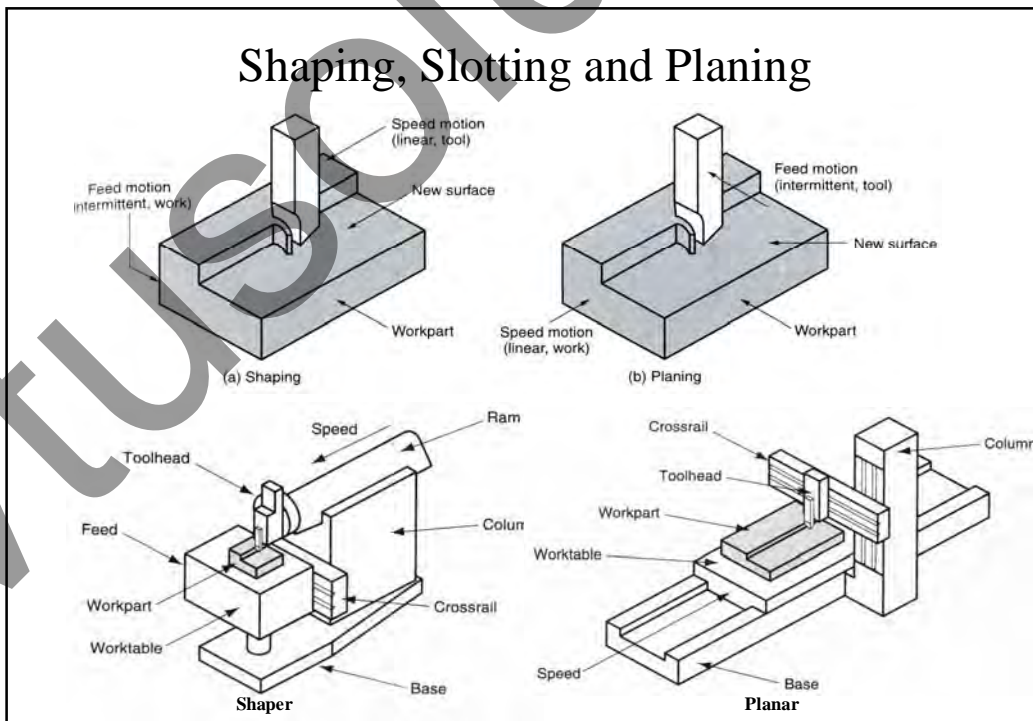
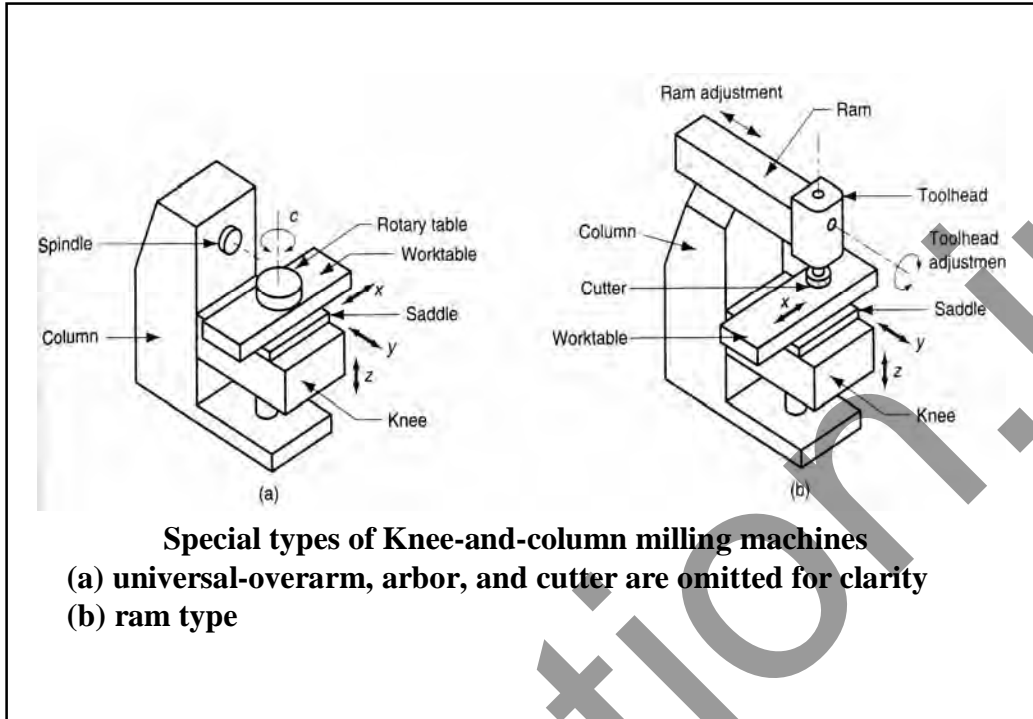
## Milling Operation



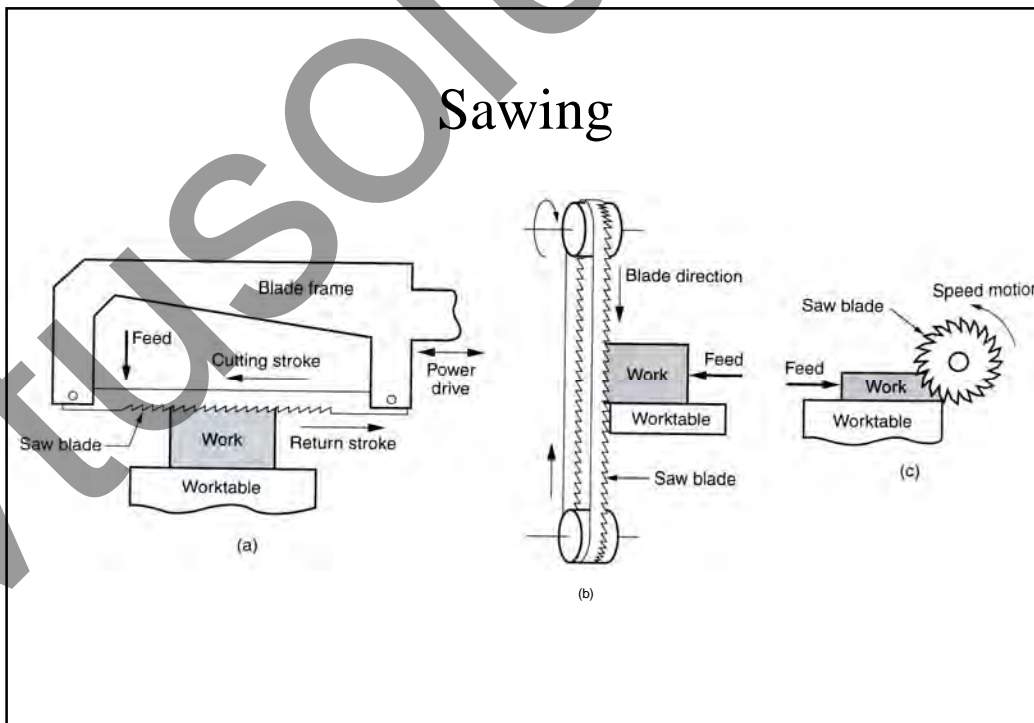
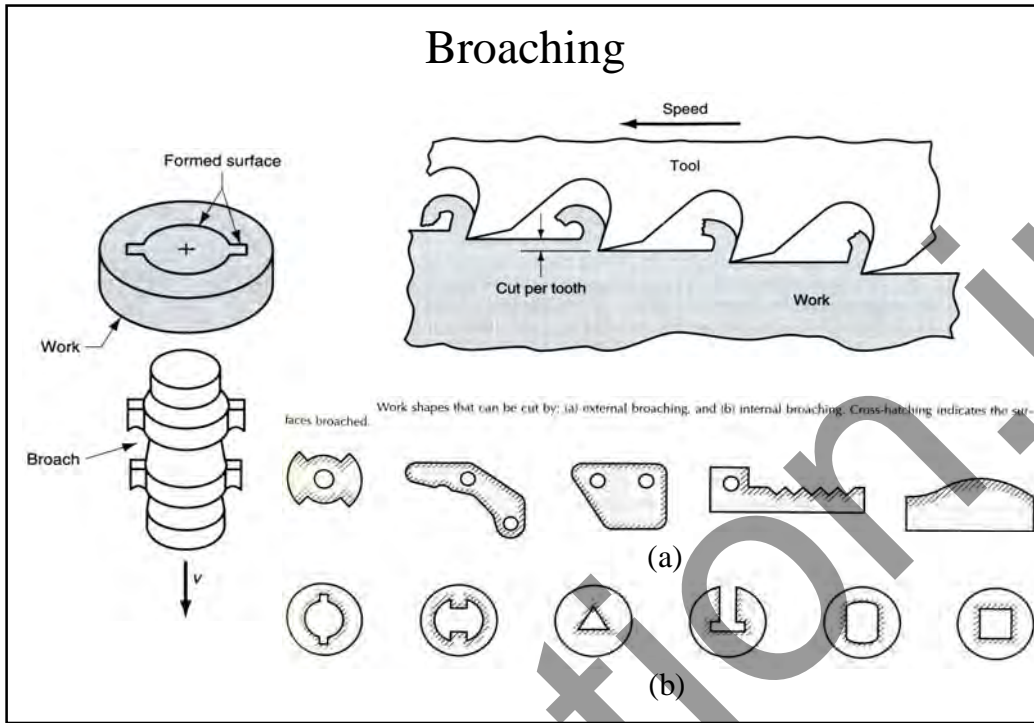


## Milling Machines



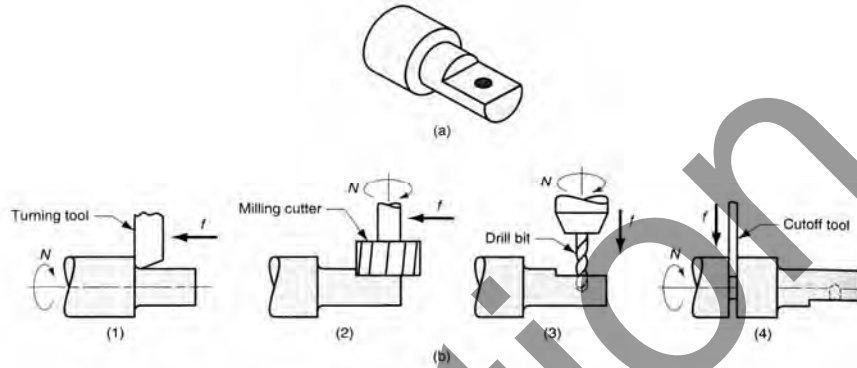






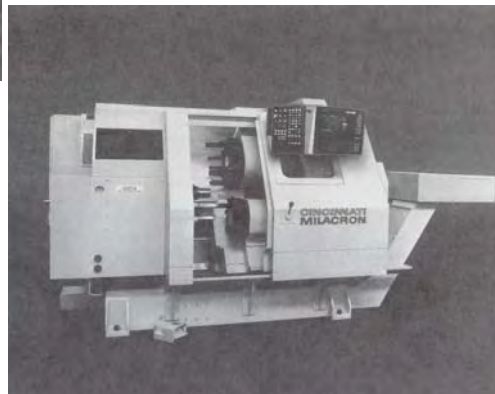
## Machining centers and Turning centers

- Automatic tool changing
- Pallet shuttles
- Automatic workpart positioning



**Universal machining center**

**CNC 4-axis turning center**



### Comparison of Machining Processes

Process	Advantages	Limitations
Turning	<ul style="list-style-type: none"> <li>All types of materials can be turned.</li> <li>Most versatile machine capable of producing external and internal circular profiles and flat surfaces.</li> <li>Low tooling cost.</li> <li>Large components can be turned.</li> </ul>	<ul style="list-style-type: none"> <li>Requires skilled labour.</li> <li>Low production rate.</li> <li>Close tolerances and fine finish cannot be achieved.</li> </ul>
Boring	<ul style="list-style-type: none"> <li>All types of materials can be bored.</li> <li>Variety of internal circular profiles can be obtained.</li> <li>Low tooling cost.</li> <li>Large components can be bored.</li> <li>Provides better dimensional control and surface finish.</li> </ul>	<ul style="list-style-type: none"> <li>Requires skilled labour.</li> <li>Low production rate.</li> <li>Suitable for internal profiles only.</li> <li>Stiffness of boring bar is an important consideration.</li> </ul>
Shaping	<ul style="list-style-type: none"> <li>Suitable for producing flat and contour profiles on small workpieces.</li> <li>Suitable for low production rate.</li> <li>Low tooling and equipment cost.</li> </ul>	<ul style="list-style-type: none"> <li>Requires skilled labour.</li> <li>Large size workpieces cannot be used.</li> <li>Only simple profiles can be obtained.</li> <li>Close tolerance and fine finish cannot be obtained.</li> </ul>

Planing	<ul style="list-style-type: none"> <li>Suitable for producing flat and contour profiles on large workpieces.</li> <li>Suitable for low production rate.</li> <li>Low tooling cost.</li> </ul>	<ul style="list-style-type: none"> <li>Requires skilled labour.</li> <li>Only simple profiles can be obtained.</li> <li>Close tolerance and fine finish cannot be obtained.</li> </ul>
Milling	<ul style="list-style-type: none"> <li>Variety of shapes including flats, slots and contours can be obtained.</li> <li>Versatile operation with wide variety of toolings and attachments.</li> <li>Suitable for low and medium production rate.</li> <li>Better dimensional control and surface finish.</li> </ul>	<ul style="list-style-type: none"> <li>Requires skilled labour.</li> <li>Tooling relatively more expansion.</li> </ul>
Drilling	<ul style="list-style-type: none"> <li>Inexpensive tooling and equipment.</li> <li>Most suitable for producing round holes of various sizes.</li> <li>High production rate.</li> <li>Machine can be used for reaming and tapping.</li> </ul>	<ul style="list-style-type: none"> <li>Requires semi-skilled labour.</li> <li>Basically a rough machining operation.</li> </ul>