TIME SCHEDULE

<table>
<thead>
<tr>
<th>MODULE</th>
<th>TOPICS</th>
<th>PERIODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Capstan and turret Lathe</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Automatic and Copying Lathe</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Machine centers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test I</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Broaching, Gear Manufacture, Press Tools,</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Processing of plastics, Jigs and Fixtures, Jig boring machines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test II</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Grinding, Other Surface Finishing Methods, Non- Conventional Machining,</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Powder metallurgy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test III</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Numerical control machine Tools, Robots And Robotics, Flexible</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Manufacturing system.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test IV</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>90</td>
</tr>
</tbody>
</table>

OBJECTIVES

MODULE I

1.1.0 Understand the working of turret and capstan lathe
1.1.1 Indicate the parts by drawing sketches of turret and capstan lathe
1.1.2 Explain the working of head stock of turret and capstan lathe
1.1.3 Explain with line sketch capstan and turret lathe mechanism -indexing, bar feeding
1.1.4 List the work holding devices
1.1.5 List the tool holding devices
1.1.6 Sketches the tool layout in sequence for a given set of operations of a work- hexagonal bolt
1.1.7 Indicate the mode of specifying a machine for the purpose of procurement

1.2.0 Comprehend the working of automatic and copying lathe
1.2.1 Define the automation
1.2.2 Define the principle of automatic control
1.2.3 List the areas of uses of automatic machines
1.2.4 Explain the diagram the working of single spindle automatic lathe
1.2.5 Classify the multi spindle automatics
1.2.6 List the advantages of single spindle Vs multi spindle automatics
1.2.7 List the various purposes of the automatic machines
1.2.8 Define the tool layout of an automatic
1.2.9 State the copying principles
1.2.10 Classify the copying machines
1.2.11 Explain, with sketch, the pantograph copying system

1.3.0 Understand the working of machining and tuning centers
1.3.1 Describe requirements of machine centers
1.3.2 List types of machining centers
1.3.3 Explain characteristics and capabilities of machining centers.
1.3.4 Explain reconfigurable machines and systems.
1.3.5 Explain hexapod machines

MODULE II

2.0 Understand the working of broachers
2.1.1 Define the principle of broaching
2.1.2 Identify the purpose of broaching
2.1.3 Explain with the diagram the broaching tool details
2.1.4 Explain the types of broaching tools
2.1.5 Explain the broaching tool material and its specifications

2.2.0 Understand the various methods of gear manufacturing
2.2.1 List the methods of gear manufacture
2.2.2 Explain the forming process in milling (review only)
2.2.3 Explain the various generating process, with sketches.
2.2.4 Define gear hobbling
2.2.5 Explain with the sketches, the principle of gear hobbling
2.2.6 Understand the advantages and disadvantages of gear hobbling
2.2.7 Specify the gear materials.

2.3.0 Understand about the press tools and their operations
2.3.1 Define the press operations
2.3.2 Explain with the various press working operations
2.3.3 Classify the dies.

2.4.0 Processing of plastics
2.4.1 Describe types of plastics – thermo, thermosetting, reinforced plastics.
2.4.2 Explain different methods of processing plastics – extrusion injection moulding blow moulding, thermoforming, casting etc

2.5.0 Appreciate the importance of jigs and fixtures
2.5.1 Define the jigs and fixtures
2.5.2 Classify the jigs and fixtures
2.5.3 State the advantages of jigs and fixtures
2.5.4 List the type of jigs and fixtures
2.5.5 Explain with the sketch drill jigs, universal jigs and indexing jigs
2.5.6 Explain the principle of location
2.5.7 Explain the principle of minimum locating points.

2.6.0 Appreciate the working of jig boring machine.
2.6.1 Define the jig borers
2.6.2 Classify the jig boring machines
2.6.3 Explain with line sketch types of jig boring machines.

MODULE III

3.1 Understand the grinding machines and its operations
3.1.1 Define grinding operations
3.1.2 Classify the abrasives
3.1.3 Explain the various types of natural and artificial abrasives
3.1.4 List the bonding material
3.1.5 List the factors affecting the selections of grinding wheel
3.1.6 Classify the various grinding machines
3.1.7 Explain the principle of cylindrical grinding with a line sketch
3.1.8 Explain with sketch the working principles of a centre less grinder
3.1.9 Explain the principle of tool and cutter grinder with a line sketch
3.1.10 Explain the basic features of finishing, honing, lapping and super finishing
3.1.11 Explain the method of truing and dressing a grinding wheel

3.2 Understand about the special surface finishing methods.
3.1.1 Explain other surface finishing method- hot dipping, anodizing, inorganic coating, metal spraying.

3.3 Understand the working of non-conventional machines
3.3.1 List the unconventional method of machining
3.3.2 Explain with sketches, the working of USM, EDM and ECM
3.3.4 State the advantages, disadvantages and application of the above operations

3.4 Recognize the importance of powder metallurgy
3.4.1 Explain the importance of powder metallurgy
3.4.2 Explain briefly various methods manufacturing metal powder such as mechanical pulverization, electrolytic process, chemical reaction and atomization
3.4.3 List the advantages of powder metallurgy.

MODULE IV
4.1 Understand the working of numerically controlled machine tools
4.1.1 State what is numerical control machine tool
4.1.2 Explain the various components with block diagram of N.C machines.
4.1.3 Explain the essential steps required for operation
4.1.4 Classify the N.C machines- feed back system and control system,
4.1.5 Explain the block diagram, the computer numerical control (CNC)
4.1.6 State the advantages of CNC machines.
4.1.7 Understand Part programming – codes
4.1.8 Write a part program for drilling ,turning
4.1.9 State the principle of CAD and CAM
4.1.10. State the advantages of CAD and CAM
4.1.11 List the application of areas of CAD and CAM
4.1.12 Explain the functioning of CAD and CAM
4.1.13 List different hardware and soft ware for CAD/CAM
4.1.14 Explain about computer aided process planning (CAPP)

4.2 Know about the robots and robotics
4.2.1 Define robotics
4.2.2 State the reason for using robots
4.2.3 List the basic elements of robots
4.2.4 Draw the various type of joints
4.2.5 Identify the notations of robot manipulator
4.2.6 Explain the configurations Robots with diagram
4.2.7 Classify the Robots
4.2.8 State what is robot arm, robot hands and robot grippers

4.3. Appreciate the advantages of flexible manufacturing system
4.3.1 Draw and explain Types of Manufacturing systems
4.3.2 State the meaning of FMS
4.3.3 Define the flexible automation
4.3.4 List the components of FMS
4.3.5 Explain with the block diagram the flexible manufacturing cell (FMC)
4.3.6 Explain how to achieve the flexibility in manufacturing systems
4.3.7 Explain briefly the components of FMS
4.3.8 Identify the problems in implementing FMS
4.3.9 Explain briefly the transport mechanism in FMS in relation with the material handling system (MHS)
4.3.10 Explain the Artificial intelligence (AI) tools for MHS planning
4.3.11 Explain briefly AGVS,
4.3.12 List the requirements to fulfill the main purpose of FMS communication systems.

CONTENT OUTLINE

MODULE I
Turret and Capstan Lathe.
Construction and parts (a) Head stock, (b) work holding devices (c) tool holding devices – straight and circular holder, flanged tool holders. Tool layout, sequence of operation.
Turret indexing mechanism and work feeding mechanism
Machine specifications.

Automatic and Copying Machines
Automation - definition, automatic control principles, types - single spindle lathe, multispindle lathe, tool layouts, Copying machines, Copying principles – types, Mechanical (pantograph copying systems)
machining and tuning centers
requirements, types, characteristics and capabilities of machine centers reconfigurable machines and systems. hexapod machines.

MODULE II
Broaching Machines
Introduction – definition - purpose, Broaching tools – parts of the tool, tool details
Types (a) internal (b) external
Broaching machines (brief description with line sketches). pull up, pull down, push down

Gear manufacture, Review of terminology of tooth shapes, Method of making gears
review of gear cutting on milling machine, casting of gears,
gear hobbling, description of gear hob, operation of gear hobbling machines
Gear materials and specifications.

Press Tools

Processing of plastics
Types of plastics – thermo, thermosetting, reinforced plastics.
methods of processing plastics-extrusion injection moulding blow moulding, thermoforming,
casting

Jigs and Fixtures
Definition of jigs and fixtures, classification of jigs and fixtures, advantages of jigs and fixtures . Constructional details of-drill jigs, Universal jigs, index jigs, milling fixture
Boring fixture, grinding fixture, welding fixture

Jig Boring
Introduction – definition, need for greater accuracy on objects like jigs, types of jig boring machines

MODULE III
Grinding
Abrasives- natural, artificial
Bonding materials -vitrified, silicate, shellac, rubber
Factors affecting the selection of grinding wheels, size and shape of the wheel
kind of abrasives, grain size, grade and structure, kind of bond material, functions of the grinding wheels, grinding machines : classifications, cylindrical grinders, Special purpose of grinders. Tool and cutter grinder. Cylindrical grinders. - centre type and centre less type grinders. Methods of truing and dressing. Various speed, feed and depth of cut for materials such as - cast iron, high carbon steel, alloy steel. Honing, lapping, super finishing

**Other surface finishing methods**
Introduction – purpose – types –, hot dipping , Metal spraying, organic coating

**Non – conventional machining**
USM , EDM and ECM , advantages, disadvantages and application

**Powder metallurgy**
importance - various stages manufacturing , advantages, applications.

**MODULE IV**

**Numerically Controlled Machine Tools**
Introduction , Block diagram of N.C machine, Steps in operation, preparation of program manuscript
Types of Numerical control system, according to the control system – ( Explain point to point, straight line, conturing system of positioning), according to feed back system ( Explain open loop system and closed loop system)

**Computer Numerical Control (CNC)**
Machine tools ( brief description only), Computer aided design ( CAD) and computer aided manufacturing ( CAM), Introduction, advantages of CAD and CAM, Part programming,CAPP, Robots and robotics
Robots - Reason for using robots, Basic elements of robots, Mechanical design of a robot, Types of joints, Notations of Robot manipulator, Configuration of robots, Robot arms, Robot hands, Grippers

**Flexible Manufacturing System ( FMS)**
Introduction, Flexible Automation, Flexible Manufacturing Cell ( FMC), Achieving Flexibility in Manufacturing Systems, Components of FMS, Problems in Implementing FMS, FMS Communication – Information, Transport Mechanism
Materials Handling System ( MHs),) Tools for MHS Planning Automated Guided Vehicle Systems ( AGVS) Artificial Intelligence ( AI)

**TEXT BOOKS**
1. Production Technology - R.K. Jain
2. Production Technology Vol I & II - O.P Khanna

**REFERENCE BOOKS**
1. Manufacturing process – Serope Kalpakjian, Steven R.Schmid
3. Modern Machining Methods - M. Adjthian
5. Computer Integrated Design and Manufacturing- Bed worth
6. CAD,CAM,CIM - Radhakrishnan
7. CNC Machines - B.S.Pabla &M.Adithan(Pub:New Age)
9. Industrial robotics - Gordon.N.Mair Pub:PHI