

COURSE TITLE : ADVANCED PRODUCTION PROCESSES
COURSE CODE : 6021
COURSE CATEGORY : A
PERIODS/ WEEK : 5
PERIODS/ SEMESTER : 75
CREDIT : 5

TIME SCHEDULE

MODULE	TOPIC	PERIODS
1	Turret and Capstan lathes, Automatic and copying lathes. Machining and turning centers.	19
2	Broaching, Gear manufacturing, Press tools, Jigs and fixtures, Jig boring machines.	19
3	Grinding & surface finishing methods, Non conventional machining.	18
4	NC & CNC machines and robotics. Flexible Manufacturing System.	19
TOTAL		75

COURSE OUTCOME :

sl.no.	sub	student will be able to
1	1	Comprehend the working of Turret and Capstan lathes.
	2	Understand the automatic and copying lathes.
	3	Appreciate the machining and turning centres.
2	4	Understand the working of broaching, gear manufacturing and press tools.
	5	Comprehend the Jigs, fixtures and Jig boring machines.
	6	Comprehend the grinding machines, surface finishing methods.
3	7	Understand the principle of non conventional machining.
	8	Appreciate the NC, CNC and robotics.
	9	Comprehend the Flexible Manufacturing System.

SPECIFIC OUTCOME

MODULE I

1.1.0 Understand the working of turret and capstan lathes

- 1.1.1 Identify the parts of turret and capstan lathes by drawing sketches
- 1.1.2 Describe the working of head stock of turret and capstan lathes
- 1.1.3 Explain capstan and turret lathe mechanism with the help of line sketch
 - indexing & bar feeding

- 1.1.4 List the work holding & tool holding devices
- 1.1.5 Sketch the tool layout in sequence for a given set of operations of a work- hexagonal bolt
- 1.1.6 State the mode of specifying a machine for the purpose of procurement
- 1.2.0 Comprehend the working of automatic and copying lathes**
- 1.2.1 Define the term automation
- 1.2.2 State the principle of automatic control
- 1.2.3 List the applications of automatic machines
- 1.2.4 Illustrate the working of a single spindle automatic lathe.
- 1.2.5 Classify the multi spindle automatic lathes
- 1.2.6 Distinguish between single spindle and multi spindle automatic lathes.
- 1.2.7 List the various purposes of the automatic machines
- 1.2.8 Define the tool layout of an automatic lathe.
- 1.2.9 State the copying principles.
- 1.2.10 Classify the copying machines.
- 1.2.11 Describe with sketch the pantograph, electric and hydraulic copying system.
- 1.3.0 Understand the working of machining and tuning centres**
- 1.3.1 Describe the requirements of machine centers
- 1.3.2 List the types of machining centers
- 1.3.3 Identify the characteristics and capabilities of machining centers.
- 1.3.4 Explain the reconfigurable machines and systems.
- 1.3.5 Describe the hexapod machines

MODULE II

2.1.0 Understand the working of broachers

- 2.1.1 Define the principle of broaching
- 2.1.2 Identify the purpose of broaching
- 2.1.3 Illustrate the broaching tool details
- 2.1.4 Select the types of broaching tools
- 2.1.5 Explain the broaching tool materials 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 Describe the forming process in milling (review only)
- 2.2.3 Explain the various gear generating processes with sketches.
- 2.2.4 State gear hobbing
- 2.2.5 Explain with the sketches, the principle of gear hobbing
- 2.2.6 Mention the advantages and disadvantages of gear hobbing
- 2.2.7 Explain the various gear finishing operations
- 2.2.8 Specify the gear materials.

2.3.0 Understand about the press tools and their operations

- 2.3.1 Identify the press operations.
- 2.3.2 Describe the various press working operations.
- 2.3.3 Classify the dies.

2.4.0 Appreciate the importance of jigs and fixtures

- 2.4.1 Identify the jigs and fixtures
- 2.4.2 Classify the jigs and fixtures
- 2.4.3 State the advantages of jigs and fixtures
- 2.4.4 List the types of jigs and fixtures

- 2.4.5 Illustrate drill jigs, universal jigs and indexing jigs
- 2.4.6 Explain the principle of location.
- 2.4.7 Describe the principle of minimum locating points.**
- 2.5.0 Appreciate the working of jig boring machine.**
- 2.5.0 Explain the jig boring machines
- 2.5.1 Classify the jig boring machines
- 2.5.2 Illustrate the different types of jig boring machines.

MODULE III

3.1.0 Understand the grinding machines and its operations

- 3.1.1 List the various grinding operations
- 3.1.2 Explain the various types of natural and artificial abrasives.
- 3.1.3 Categorize the bonding materials
- 3.1.4 Mention the factors affecting the selection of grinding wheel
- 3.1.5 Classify the various grinding machines
- 3.1.6 Explain the principle of cylindrical grinding with a line sketch
- 3.1.7 Illustrate the working principles of a centre less grinder
- 3.1.8 Explain the principle of tool and cutter grinder with a line sketch
- 3.1.9 Distinguish the basic features of finishing, honing , lapping and super finishing
- 3.1.10 Explain the method of mounting, truing and dressing a grinding wheel**

3.2.0 Understand about the special surface finishing methods.

- 3.2.1.1 Describe other surface finishing methods such as hot dipping, anodizing, electroplating, organic coating, metal spraying.

3.3.0 Understand the working of non-conventional machines

- 3.3.1.1 List the nonconventional methods of machining
- 3.3.1.2 Describe the working of USM , EDM, AJM, LBM and ECM
- 3.3.1.3 State the advantages, disadvantages and applications of the above mentioned operations

MODULE IV

4.1.0 Understand the working of numerically controlled machine tools

- 4.1.1 State the numerical control machine tool
- 4.1.2 Explain the various components of N.C machines with block diagram.
- 4.1.3 List the essential steps required for operation.
- 4.1.4 Classify the N.C machines- feedback system and control system ,
- 4.1.5 Illustrate the block diagram- computer numerical control (CNC)
- 4.1.6 State the advantages of CNC machines.
- 4.1.7 Identify the Part programming – code
- 4.1.8 Write a part program for drilling, and turning
- 4.1.9 State the principle of CAD and CAM
- 4.1.10 Mention the advantages of CAD and CAM
- 4.1.11 List the applications of CAD and CAM
- 4.1.12 Explain the functions of CAD and CAM
- 4.1.13 List the different hardwares and software for CAD/CAM
- 4.1.14 Describe the computer aided process planning (CAPP)

4.2.0 Appreciate 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 Define degrees of freedom and explain its importance.
- 4.2.5 Draw the various types of joints
- 4.2.6 Identify the notations of robot manipulator
- 4.2.7 Explain the configurations of Robots with diagram
- 4.2.8 Classify the Robots

4.2.9 Explain the robotic arm, robotic hands and grippers

4.3.0 Appreciate the advantages of flexible manufacturing system

- 4.3.1 Define Flexible Manufacturing systems
- 4.3.2 Define flexible automation
- 4.3.3 List the components of FMS
- 4.3.4 Illustrate the flexible manufacturing cell (FMC)
- 4.3.5 Explain how to achieve the flexibility in manufacturing systems
- 4.3.6 Describe briefly the components of FMS
- 4.3.7 Identify the problems in implementing FMS
- 4.3.8 Explain the transport mechanism in FMS in relation with the material handling system (MHS)
- 4.3.9 Identify the Artificial intelligence (AI) tools for MHS planning
- 4.3.10 Describe the AGVS,
- 4.3.11 List the requirements to fulfill the main purpose of FMS communication systems.
- 4.3.12 Explain the principle of CIM

CONTENT DETAILS

MODULE I

Turret and Capstan Lathe.

Construction and parts - Head stock- work holding devices - 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- multi spindle lathe- tool layouts- Copying machines- Copying principles – types- Mechanical (pantograph copying systems)

Machining and Turning Centers

Requirements- types- characteristics and capabilities of machine centers - Reconfigurable machines- systems- Hexapod machines.

MODULE II

Broaching Machines

Introduction – definition - purpose - Broaching tools – parts of the tool- tool details - Types - internal - 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 - specifications.

Press Tools

Introduction – components of presses- Press working operation – piercing- blanking- bending- notching- trimming- shaving- slitting- lancing- nibbling- beading- classification of dies- Principles of metal cutting- Different types of dies.

Jigs and Fixtures

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

Jig Boring Machines

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 grinders - Tool and cutter grinder - Cylindrical grinders - centre type and centre less type grinders - Methods of truing and dressing- Various speed- feed - 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- AJM- LBM – ECM- advantages- disadvantages- application

MODULE IV

Numerically Controlled Machine Tools

Introduction- Block diagram of N.C machines- Steps in operation- preparation of program manuscript - Types of Numerical control system- according to the control system – (Explain point to point - straight line - contour 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)-Computer Aided Manufacturing (CAM)- Introduction- advantages of CAD – CAM- Part programming- CAPP

Robotics

Robotics - 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)- Introduction to CIM

TEXT BOOKS

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

REFERENCE

- | | |
|---|---------------------------------------|
| 1. Manufacturing process | – Serope Kalpakjian, Steven R.Schmid |
| 2. A Text Book of Production Engineering | - P.C. Sharma |
| 3. Modern Machining Methods | - M. Adithian |
| 4. Machine Tools Vol. I | - R.N. Datta |
| 5. Computer Integrated Design and Manufacturing | - Bed worth |
| 6. CAD, CAM, CIM | -Radhakrishnan |
| 7. CNC Machines | - B.S.Pabla &M.Adithan (Pub: New Age) |
| 8. Numerical control and computer aided manufacturing | -T.K.Kundra, P.N.Rao (Pub: TMH) |
| 9. Industrial robotics | - Gordon.N.Mair Pub: PHI |
| 10. CAD/CAM | -Ibrahim Zeid, R Sivasubramanian |