INDEX

UNIT I

Chapter 1 :   Non Conventional Machining Processes
1-1 to 1-31

Syllabus:

1.1 Fundamentals of Non – conventional methods : Needs and types of non – conventional methods, Importance of methods.

1.2 Working principles , set up Process Parameters of : EDM, WEDM, ECM, PAM, AJM, USM , EBM and LBM.

1.3 Advantages , limitations and applications of : EDM, WEDM, ECM, PAM, AJM, USM , EBM and LBM.

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UNIT II

Chapter 2 : Milling Machines and Milling
Processes   2-1 to 2-16

Syllabus:

2.1   Milling   : Working Principle of milling machine, types of milling machines

2.2   Milling cutters : Different types of cutters used in milling, face milling cutter, end milling cutter, staggered tooth milling cutter, side and face milling cutter, form milling cutter, metal slitting saw etc.

2.3   Milling Processes : Plain milling, face milling , side milling, end milling, straddle milling, gang milling, ,slotting , slitting, Up milling and down milling

2.4   Cutting Parameters : Cutting speed, feed

2.5   Dividing Head : Types, function of dividing head, method of indexing, index plates.

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UNIT III

Chapter 3 : Gear Manufacturing　　　3-1 to 3-12

Syllabus :

3.1 Gear Manufacturing Methods : Function and types of gears, gear manufacturing methods,

3.2 Gear Hobbing : Working principle, types of gear hobbing , advantages, limitations, and applications of gear hobbing

3.3 Gear Shaping : Gear shaping by pinion cutter, gear shaping by rack cutter, advantages. Limitations , and applications of both the methods and comparison of gear hobbing and gear shaping

3.4 Gear Finishing methods : Need of gear finishing, gear finishing methods a) Gear shaving　b) Gear grinding c) Gear burnishing d) Gear lapping e) Gear honing

UNIT IV

Chapter 4 : Fundamentals of Computer Aided Manufacturing (CAM)   4-1 to 4-26

Syllabus :

4.1 CAM Concept, NC (Numerical Control), CNC (Computerized Numerical Control) and DNC (Direct Numerical Control): concept, features and differences.

4.2 **CNC machines:** Types, classification, working and constructional features Advantages, limitations and selection criteria.

4.3 **Elements of CNC machines**: Types, sketch, working and importance of: Slide ways; Re-circulating ball screw; Feedback devices(transducers, encoders); Automatic tool changer(ATC); Automatic pallet changer(APC)

4.4 **CNC tooling :** Tool presetting-concept and importance; Qualified tools-definition need and advantages; Tool holders-types and applications.

4.5 **CNC turning centers :** Types, features; Axes nomenclature; Specification; Work holding devices-types, working and applications.

4.6 **CNC machining centers :** Types, Features; Axes nomenclature; Specification; Work holding devices-types, Working and applications.

UNIT V

Chapter 5 :   CNC Part Programming   5-1 to 5-94

Syllabus :

5.1 Definition and importance of various positions like machine zero, home position, work piece zero and programme zero.

5.2 CNC part programming: programming format and structure of part programme.

5.3 ISO G and M codes for turning and milling-meaning and applications of important codes.

5.4 Simple part programming for turning using ISO format having straight turning, taper turning (linear interpolation) and convex/concave turning(circular interpolation)

5.5 Simple part programming for milling using ISO format.

5.6 Importance, types, applications and format for: Canned cycles; Macro; Do loops; Subroutine.

5.7 CNC turning and milling part programming using canned cycles, Do loops; Subroutine.

5.8 **Need and importance of various compensations**: Tool length compensation; Pitch error compensation; Tool radius compensation; Tool offset.

5.9 Simple part programming using various compensations.

5.10 Virtual CNC machine simulators. Generation of generating shop documentation using a CAM software, cycle time sheets, tools list with tool layout, spindle utilization graphs, program for different control systems and different configuration of machines.

UNIT VI

Chapter 6 : Automation and Robotics   6-1 to 6-35

Syllabus :

6.1   **Automation** : Define, need of automation, high and low cost automation, examples of automations.

6.2   **Types of Automation** : Fixed(Hard) automation, programmable automations and Flexible automations(Soft). Comparison of types of automations.

6.3   **Group Technology** : concept, basis for developing part families, part classification and coding with example, concept of cellular manufacturing. Advantages and limitations.

6.4   **Flexible Machining System** : Introduction, concept, definition and need, sub systems of FMS, comparing with other manufacturing approaches.

6.5   **Introduction to Robotics** : Definition of robot and robotics, advantages, disadvantages and applications.

6.6   Components of Robotics manipulator, end effectors, actuators, sensors, controller, processor and software.

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