

**INDEX****UNIT I****Chapter 1 : Non Conventional Machining Processes****1-1 to 1-31****Syllabus:**

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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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- 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

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- 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.

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- 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.

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- 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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