

MEPC2006 BASIC MANUFACTURING PROCESSES (3-0-0)

Course Objectives

1. To introduce students to fundamental manufacturing processes, including primary and secondary processes, and their importance in engineering applications.
2. To familiarize students with the principles and practices of metal casting, including the design of gating systems, properties of moulding materials, and defect analysis.
3. To provide an understanding of various welding techniques, including gas welding, arc welding, resistance welding, and solid-state welding, along with their applications and testing methods.
4. To explain the concepts of metal forming processes such as rolling, forging, extrusion, and sheet metal working, focusing on their principles, techniques, and defect analysis.
5. To give students an overview of advanced manufacturing techniques such as explosive forming and coating methods, and their applications in industry.

Module-I (10hrs)

Manufacturing concepts: Primary and secondary manufacturing processes, Principle of metal casting: Terminology, Types of patterns, pattern materials and pattern allowances. Moulding Materials, sand casting, continuous casting, centrifugal casting, die casting, investment casting, shell moulding. Composition of moulding sand, binders, additives. Properties of moulding sand and sand testing. Casting defects. Melting furnaces - cupola, resistance furnace, induction and arc furnace, Solidification of castings, design of sprue, gating system, runner, and riser.

Module-II (08hrs)

Weldability; Classification of welding processes, Introduction to gas welding, Oxyacetylene welding, Flame cutting. Principles and processes of arc welding (SMAW, GTAW, GMAW, FCAW, PAW, SAW). Brazing and soldering; Principle of resistance welding. Principle of friction welding, Solid state welding; Weld inspection and testing.

Module-III (06hrs)

Formability of metals; Cold and hot working; Rolling: types of rolling mills, Rolling defects. Forging: Smith Forging, Drop and Press forging, M/c forging, Forging defects. Extrusions: Direct, Indirect, Impact and Hydrostatic extrusion and their applications.

Module-IV (06hrs)

Brief introduction to sheet metal working: Bending, Forming, Deep drawing, Wire drawing shearing, Stretch forming, Metal spinning, Embossing and Coining. Brief introduction to explosive forming, coating and deposition methods.

Course Outcomes (CO) After completing this course, students will be able to:

1. Define the basic concepts and classifications of primary and secondary manufacturing processes.
2. Explain the principles of metal casting, welding, and forming processes, along with their underlying mechanisms and materials.
3. Apply knowledge of casting design to create appropriate sprue, gating systems, and risers for defect-free castings.
4. Analyze various manufacturing processes like welding and rolling to identify defects, determine process suitability, and recommend improvements.
5. Evaluate the properties of moulding sand, weldments, and formed metals to ensure quality and process efficiency.

Design innovative solutions for manufacturing challenges, integrating advanced techniques like coating methods and explosive forming for complex engineering applications.

Books:

1. Manufacturing technology by P.N.Rao, Tata McGraw Hill publication.
2. Welding Technology by R.A. Little, TMH
3. Manufacturing Engineering & Technology by Kalpak Jain, Addition Wesley Edition
4. Principles of Metal Casting by Hein and Rosenthol, Tata Mc-Graw Hill India.
5. A Text Book of Production Engineering by P.C.Sharma, S.Chand.