

## ME261 Primary Manufacturing Processes

**Credits:** 2L-0T-1P-0A (7 Credits)

### **Objectives:**

The main objective of this course is to acquaint students with various manufacturing processes such as casting, joining, bulk deformation and additive manufacturing. The course includes design aspects, mechanistic analysis and defects associated with these processes.

### **Course contents:**

Introduction to primary manufacturing processes and properties of materials.

Casting and solidification of alloys: Mechanism; Analysis of cooling curve; Runner and gating system design; Riser design.

Joining processes: Fusion welding mechanism; Heat flow and material transfer mechanism; Microstructure formation; Welding defects and inspection.

Bulk deformation processes: Brief review of plastic deformation and yield criteria; Mechanistic analysis of Forging, Rolling, Drawing and Forming processes including defects.

Additive manufacturing processes: Mechanistic analysis of polymers, metals and ceramics based additive manufacturing processes.

### **Laboratory sessions:**

- 3-D printing experiment
- Aluminium die casting experiment
- Metal forming: Deep drawing experiment
- Multi Gating flow experiment

### **References:**

- Ghosh, A. Mallik, A.K. Manufacturing Science (2nd edition), EastWest Press
- Groover, M.P. Fundamentals of Modern Manufacturing (2nd edition), John Wiley
- Kalpakjian, S. Schmid, S.C. Manufacturing Engineering and Technology, Pearson Education
- Loper, C.R. Rosenthal, P.C. Heine, R.W., Principles of Metal Casting, McGraw Hill
- Little, R. Welding and Welding Technology, McGraw Hill
- Dieter, G.E. Mechanical Metallurgy, McGraw Hill
- Gibson, I. Rosen, D.W. Stucker, B. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer