

PMT5I102 SOLIDIFICATION AND CASTING PROCESSES

Module I (14 Hours)

1. **Introduction:** Casting as a process of Manufacturing. Advantages of casting over other forming processes. A brief mention about mould and its components etc. with special reference to mould factors in metal flow and moulding factors in casting design.
2. **Special Casting Methods:** Investment casting, Die casting, Centrifugal casting, Full mould casting, Vacuum sealed casting etc.
3. **Melting Practices for Casting Purposes:** Role of Ellingham diagram in melting of Metals for casting purposes; melting and post-melting treatments; Industrial melting practices as adopted for a few metals and alloys such as; Cast-iron; Steel; Copper; Aluminium, etc.

Module II (12 Hours)

4. **Solidification of Metals and Alloys:** Crystallisation, Liberation of energy and solute redistribution. Nucleation and growth processes; planar growth and factors hindering planar growth; Dendritic growth; Cellular growth; Independent nucleation; Eutectic freezing, Peritectic reactions.
5. **Structure of Casting:** Additional influences on structure.
6. **Practical Control of Cast Structure:** Grain shape and orientation; grain size consideration. Brief discussions on refinement and modification of cast structure.

Module III (10)

7. **Principles of Gating and Riser:** Types of gates and Risers; Chvorinov rule; Gating ratio, Wlodawer system of determining feeder head requirements.
8. **Casting Yield:** Various considerations for improving casting yield.
9. **Casting Defects and Their Remedies:** Various casting Defects; Their causes and remedial measures.

Books for reference:

1. *Solidification Processing* by M.C. Flemings, McGraw Hill.
2. *Physical Metallurgy* edited by R.W.Cahn and P.Hassen, North Holland.
3. *Casting* by J. Campbell, Butterworth - Haneman, London.
4. *Principles of Metal Casting* by Hein R.W., Loper C. R. & Rosenthal P.C, T.M.H.
5. *Foundry Engineering* by Taylor H.F., Flemming M.C. & Wulff, Wiley Eastern.
6. *Foundry Technology* by Beeley P.R., Butterworth, London.