

AMMR-7 FOUNDRY METALLURGY

1. Introduction to foundry, Casting production. Sand & Non-sand Casting processes,
2. Special Casting processes Full mold, Shell molding, CO₂, Die, Investment, Centrifugal etc.
3. Sand molding materials, their properties, selection & testing (Grading of sand, GCS, DCS, Permeability etc) Bonding & bond mechanisms (Clay-water, Hydraulic & Organic),
4. Selection of Foundry Clay (Bentonite Structure, Base exchange capacity & Acceptability Test.). Additives, Mechanization of Sand molding Process,
5. Patterns- Allowances, Types, Selection etc. Gating Design, Laws of fluid flow, Top & Gating Time, Aspiration correction, Design of gating for a plate casting.
6. Riser Design (Modulus method, Geometry of risers, Directional solidification, Chill, Padding etc..) Complete Methoding Practice from Pattern to riser/gating design of individual castings.
7. Solidification of - Metals, Alloys & Eutectics, (Nucleation & Growth Process, Critical nucleus size, Supercooling, G/R ratio, Cell, Dendritic & Random dendritic structure,
8. Segregation & Coring, Eutectics, Compositions in Cast Irons, FG & SG structures, Metallic Glass).
9. Mold dilation, Mold-metal reactions. Structure & Section sensitivity Cast irons- family & microstructures, Alloying effects, Cupola & its operation, nodular iron and alloy cast irons.
10. White (Malleable) Iron, ADI, Charge calculations.
11. Non-ferrous casting production (Silumin alloys, Liquid forging, Brass & Bronze casting)
12. Melting furnaces (Arc, Induction, Gas & Oil fired furnaces, Fluxes).
13. Fettling & finishing, Casting defects- Hot tears, Inclusions and porosities.
14. NDT testing & inspection, Casting design.

Reference books:

1. "Non-Ferrous Foundry Metallurgy: The Science of Melting and Casting Non-Ferrous Metals and Alloys" by Alfred John Murphy
2. "Foseco Non-Ferrous Foundryman's Handbook" by John Brown