



Molten Metal Processing

MATSCEN 5451

Credit Hours:

3.00

Course Levels:

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

Course Components:

Lecture

Course Description:

An advanced class in application of thermodynamics, kinetics, and macro-transport phenomena to primary metals production, refining, and solidification processing.

Prerequisites and Co-requisites:

Prereq: 2251 or 3151; or Grad standing; or permission of instructor.

Course Goals / Objectives:

- Learn extraction, refining, and processing of metals
 - Learn metal casting science and technology
 - Learn solidification science and technology
 - Learn recycling of metals
 - Learn numerical simulation of casting processes
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Course Topics:

- Reduction of metal oxides (the iron blast furnace, electric iron smelting, reduction of other iron oxides ores)
 - Matte smelting (iron-copper mattes, copper smelting, nickel smelting, other matte smelting processes)
 - Electrometallurgy (refining cells, production cells, aqueous winning and refining processes, fused salt processes)
 - Refining processes (steel-making reactions, basic oxygen process - BOS, OBM, Q-OBM, electric arc melting process, AOD stainless steel process)
 - Ladle metallurgy for steel and cast iron (injection metallurgy, electromagnetic stirring, desulfurization, deoxidation, vacuum degassing)
 - Macro-solidification (macroshrinkage, macrosegregation)
 - Continuous casting of steel and non-ferrous alloys (tundish metallurgy, molds for horizontal and vertical casting)
 - Shaped casting (sand casting, die casting, investment casting)
 - Other solidification processes (semi-solid casting, rapid solidification, spray casting)
 - Chemical vapor deposition
 - Recycling of metals
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Designation:

Elective