



**THE OHIO STATE UNIVERSITY**  
COLLEGE OF ENGINEERING

# Molten Metal Processing

## MATSCEN 5451

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**Credit Hours:**

3.00

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**Course Levels:**

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

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**Course Components:**

Lecture

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**Course Description:**

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

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**Prerequisites and Co-requisites:**

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

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**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