



# Physical Metallurgy

## MATSCEN 5441

**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:**

Physical metallurgy of ferrous and non-ferrous alloys. Emphasis on alloy design, processing and structure-property relations.

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**Prerequisites and Co-requisites:**

Prereq: 3141, 3261, and enrollment as MatScEn-BS major student; or Grad standing; or permission of instructor.

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**Course Goals / Objectives:**

- Understanding of principles of alloy design: Effect of alloying elements on phase stability and morphology, transformation kinetics, and alloy properties
  - Familiarity with major classes of ferrous and non-ferrous alloys
  - Understanding general principles and specific practices of thermo-mechanical processing of alloys
  - Understanding processing-structure-property relations in specific alloys
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**Course Topics:**

- Review of Liquid-Solid and Solid-Solid Transformations
  - The Fe-C System & Plain-Carbon Steels (Austenite Decomposition Reactions, IT, CT)
  - Hardenability, HSLA Steels, Surface Hardening
  - Stainless Steels
  - Tool Steels and other specialty steels (electrical)
  - Advanced High-Strength Steels (AHSS)
  - Cast Irons
  - Aluminum Alloys & Magnesium Alloys (Cast & Wrought, Strain/Solution/Pcpt Strengthened Alloys)
  - Titanium Alloys (alpha, alpha-beta, beta)
  - Superalloys (Ni-base, Fe-base, Ni+Fe), Oxidation Resistance
  - Copper Alloys (Copper, brasses, bronzes, Cu-Be)
  - Metallic Glasses
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**Designation:**

Elective