THE OHIO STATE UNIVERSITY

COLLEGE OF ENGINEERING

# **Physical Metallurgy**

# **MATSCEN 5441**

### **Credit Hours:**

3.00

# **Course Levels:**

Undergraduate (1000-5000 level) Graduate (5000-8000 level)

#### **Course Components:**

Lecture

#### **Course Description:**

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

#### Prerequisites and Co-requisites:

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

# **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

#### **Designation:**

Elective