



**THE OHIO STATE UNIVERSITY**  
COLLEGE OF ENGINEERING

# Magnetic Materials

## MATSCEN 6778

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**Credit Hours:**

2.00 - 2.00

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**Course Levels:**

Graduate (5000-8000 level)

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**Course Components:**

Lecture

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**Course Description:**

This course teaches the basic properties of magnetic materials in a wide class of materials including metals, insulators, semiconductors. The relationships between structure, composition, processing, and magnetic properties will be reviewed with a special focus on the atomic origins of magnetism and the ability to engineer these mechanisms through alloying or doping, or layered structures.

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**Prerequisites and Co-requisites:**

Prereq: Grad standing in Engineering or Mathematical and Physical Science; or permission of instructor.

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**Course Goals / Objectives:**

- Develop a technical knowledge of fundamental magnetic properties
  - Develop a working knowledge of the atomic origins of magnetism
  - Develop theoretical understanding of types of magnetism
  - Develop an understanding of the role of domain structure in magnetization
  - Develop understanding of Anisotropy
  - Introduce the concept of engineering magnetic properties by composition, structure, and processing control.
  - Introduce how magnetic properties affect other functional properties such as structural, electronic, and optical properties.
  - Develop the ability to critically examine and understand recent scientific literature
  - Develop the ability to give oral presentations on scientific literature as well as write review papers on scientific sub-fields
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**Course Topics:**

- Fundamental magnetic properties
  - Atomic origins of magnetism
  - Theories of magnetism
  - Domain structure
  - Anisotropy
  - Magnons – spin waves
  - Magnetotransport
  - Spin Caloritronics
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**Designation:**

Elective