Magnetic Materials

MATSCEN 6778

Credit Hours:
2.00 - 2.00

Course Levels:
Graduate (5000-8000 level)

Course Components:
Lecture

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.

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

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

Designation:
Elective