

MAGNETIC MATERIALS AND DEVICES

SYLLABUS

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COURSE DESCRIPTION

Introducing fundamentals of magnetic materials for the next-generation magnetic, nanomagnetic, and spintronics-related technologies. Includes basics of magnetism, models of the equivalent magnetic charge and current, paramagnetic and diamagnetic materials, soft and hard magnetic materials, equivalent magnetic circuits, and magnetic system design foundations.

TOPICS

- Review of basic magnetostatics
- Magnetization and magnetic materials
- Atomic origins of magnetism
- Diamagnetism
- Paramagnetism
- Interactions in ferromagnetic materials
- Ferromagnetic domains
- Antiferromagnetism
- Ferrimagnetism
- Anisotropy
- Nanoparticles and thin films
- Magnetoresistance
- Superconductors
- Spin-FETs
- Magnetic data storage
- Magnetic storage media
- Magnetic read and write heads
- GMR, spin valve
- Magneto-optics recording
- Magnetic semiconductors and insulators

EXAMS

No exams, No HWs

GRADING POLICY

Group project presentation

Recommended Books and References (Notes will be provided)

1. **B. D. Cullity and C. D. Graham, "Introduction to Magnetic Materials", Wiley-IEEE, 2009, ISBN: 0-471-47741-9, 2nd ed., 2008 (Text Book)**
2. Sôshin Chikazumi, "*Physics of Ferromagnetism*", Oxford University Press, 2009, ISBN: 978-0-199-56481-1
3. Richard M. Bozorth, "*Ferromagnetism*", IEEE Press, ISBN 0-7803-1032-2, 1978
4. K. Krishnan, *Fundamentals and Applications of Magnetic Materials*