Florida State University

CHM 5xxx / PHY 5xxx / ENG 5xxx

Magnetism and Magnetic Materials

Instructors: **xx, xx, xx**

Office hours: xx:xx-xx:xx xm xday, Room xx

Lecture: Xday xx:xx-xx:xx, HTL 21x

Course Materials: **xxxxxx**

Grading: 30% Homeworks
30% Literature Presentation
40% Final Examination

Grades will be assigned based on a standard scale (A/A- = 100-90%; B± = 89-80%; C±=79-70%; etc...)

Course Description: This course will provide students with the fundamental knowledge in the field of magnetism and magnetic materials. The course will be offered as a two-semester sequence, consisting of three contiguous 5-week sections in each semester.

Course Objective: At the end of the course, the student will be able to explain fundamental concepts of magnetism; apply those concepts to understand the nature of magnetic behavior of various materials; propose methods for characterization of magnetic materials; discuss various applications of magnetic materials in cutting-edge technologies and devices.

Course Schedule: The class will be comprised of three 5-week sections in each semester. Each 5-week section will meet two or three times a week, and the final examination will take place at the end of the semester.

Course Content:

I. Fundamentals of Magnetism
1. Diamagnetism and paramagnetism. Units of measurement.
2. Magnetization and magnetic susceptibility, Curie law, Brillouin function.
3. Total spin and orbital angular momenta; spin-orbit coupling, zero-field splitting.
4. Anisotropy of the *g*-factor and magnetic susceptibility.
5. Spin exchange Hamiltonian, dimers, Curie-Weiss law.
6. Multinuclear exchange coupled systems.
7. Magnetically ordered state; ferro-, ferri- and antiferromagnetism.
8. Magnetization, magnetocrystalline and magnetostatic energy, domains and domain walls.
9. Long- and short-range order, spin glasses.

II. Characterization Methods
1. Magnetometry: SQUID and vibrating sample magnetometer.
2. Electron paramagnetic resonance.
3. Nuclear magnetic resonance of paramagnetic systems.
4. Mössbauer spectroscopy.
5. Neutron diffraction.
6. X-ray magnetic circular dichroism.

III. Magnetic Materials
1. Spin-crossover complexes.
2. Photomagnetic compounds.
3. Single-molecule magnets.
4. Nanomagnets.
5. Spin-frustrated systems and spin glasses.
6. Metamagnets.
7. Itinerant magnets.

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Academic Honor Policy: The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout this process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to "…be honest and truthful and … [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at http://dof.fsu.edu/honorpolicy.htm).

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Americans with Disabilities Act: Students with disabilities needing academic accommodation shoud:

(1) register with and provide documentation to the Student Disability Resource Center; and

(2) bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class.

This syllabus and other class materials are available in alternative format upon request.

For more information about services available to FSU students with disabilities, contact the Student Disability Resource Center, 874 Traditions Way, 108 Student Services Building, Tallahassee, FL 32306-4167, TEL: 850-644-9566 (voice), 850-644-8504 (TDD); email: sdrc@admin.fsu.edu; Web Site: http://www.disabilitycenter.fsu.edu/.