Materials Science

Materials Science is an interdisciplinary field combining physics (fundamental laws of nature), chemistry (interactions of atoms) and biology (how life interacts with materials) to elucidate the inherent properties of basic and complex systems. This includes optical (interaction with light), electrical (interaction with charge), magnetic and structural properties of everyday electronics, clothing and architecture. The Materials Science central dogma follows the sequence: Structure—Properties—Design—Performance. This involves relating the nanostructure of a material to its macroscale physical and chemical properties. By understanding and then changing the structure, material scientists can create custom materials with unique properties.

The goal of the materials science minor is to create a cross-disciplinary approach to fundamental topics in basic and applied physical sciences. Students will gain experience and perspectives from the disciplines of chemistry, physics and biology. The minor places a strong emphasis on current nanoscale research methods in addition to the basics of electronic, optical and mechanical properties of materials.

Any student with an interest in pursuing the cross-disciplinary minor in materials science should consult with the coordinator of the minor. Students are encouraged to declare their participation in their sophomore year but no later than the end of the junior year. Students also should seek an adviser from participating faculty.

Degree Requirements for the Minor

General College requirements (see “Curriculum” section).

- Must take CHEM 106 (Meets Core Curriculum requirement Natural Sciences with Laboratory.)

All requirements in a major discipline of study

Required Courses (20 credit hours):

- PHYS 141: General Physics I *or* PHYS 151: Fundamentals of Physics I (Co-req MATH 151)
- PHYS 142: General Physics II *or* PHYS 152: Fundamentals of Physics II (Pre-req PHYS 141, co-req Math 152)

- MTSC 301: Introduction to Materials Science (Pre-req CHEM 106, PHYS 142)
- CHEM 311: Organic Chemistry I (Pre-req CHEM 106)
- PHYS 462: Quantum Mechanics (Pre-reqs MATH 256, PHYS 142/152. PHYS 251 is also a pre-req, though students with several chemistry courses may seek the instructor's permission to have it waived.)

Elective Courses (4 credit hours)

- CHEM 312: Organic Chemistry II (Pre-req CHEM 311)
- CHEM 405: Inorganic Chemistry (Pre-req CHEM 312)
- CHEM 451: Physical Chemistry I (Pre-req CHEM 106, PHYS 141, MATH 152)
- BIOL 471: Molecular Biology (Pre-req BIOL 105, BIOL 105L, Co-req CHEM 311)
- MTSC 302: Directed Research in Materials Science
- PHYS 311: Electronics (Pre-req PHYS 251)
- Upper-level Special Topics Courses in Biology, Chemistry or Physics, or other disciplines, specifically approved for Materials Science. (e.g. CHEM 480-03: Nanotechnology)

  Elective courses may not also be taken for credit for a major (For example, chemistry majors must choose from BIOL 471, MTSC 302 or PHYS 311 for elective credit for a MTSC minor). A completed materials science St. Mary's Project or materials science internship may be substituted for MTSC 302 with approval of the Coordinator.