

### **Materials Science and Engineering Interdisciplinary Minor**

The study of material science and engineering has spurred breakthroughs in applications ranging from artificial limbs and organs, to space travel vehicles, to personal MP3 players. For example, the discovery of buckeyballs and carbon nanotubes has led to the development of an unprecedented reduction in size of prototype electronic components, and points the way to tomorrow's electronic technologies. Porous nanostructures of biocompatible materials are studied for targeted drug delivery within the body. The integration of polymers and semiconductors is used to create efficient, useable solar cells to reduce our dependence on fossil fuels. There are many more examples of both existing technologies and current research areas involving material science and engineering that impact every day life both today and in the future.

The minor in materials science and engineering is open to all students of the College of Engineering whose science and technical interests involve the design, processing, and optimization of engineering materials. Since the materials interests may vary across the engineering disciplines, the minor is composed of an interdisciplinary selection of courses that offer a high degree of flexibility to the student. The fundamental goals of the program are to offer the students a broad interdisciplinary program that includes a basic background in the relevant aspects of material science and the engineering applications of materials. The objectives are to serve the needs of the chemical, civil, electrical, and mechanical engineering departments in providing a vehicle to expose students to material science and engineering. Particular focus areas include: electronic materials and processing for device applications; strength, wear, and corrosion-resistant coatings; molecular-level design of thin films and nanostructures; polymers and biomedical applications; and steels, concretes, and space-based structures.

Students from outside the College of Engineering will need to speak with an advisor about additional prerequisites that may be required.

**Course Requirements:**

<p style="text-align: center;">Core Courses<sup>1</sup></p> <p>MIM U340 and 1 additional course from the core course list must be completed (8SH min)</p>	<p>Required:</p> <p>MIM U340 Introduction to Materials Science 4SH</p> <p>Choose 1 of the following:</p> <p>ECE U392 Electronic Materials 4SH</p> <p>CIV U260/U261<sup>2</sup> Civil Engineering Materials/Lab 3SH/2SH</p> <p>CHE U360 Biomaterials ** 4SH</p>
<p style="text-align: center;">Electives<sup>3</sup></p> <p>Chose at least 2 (8SH min)</p>	<p>Courses from list below or additional core courses not used to satisfy the core course requirement. An additional elective, a 3<sup>rd</sup>, can be chosen in place of the MSEI Capstone.</p>
<p style="text-align: center;">MSEI Capstone<sup>4,5</sup></p> <p>Optional: Can be substituted for one half of the required Capstone courses with the approval of the major department and the MSEI Executive Committee<sup>6</sup></p>	<p>MSEI Capstone Design (4 SH)</p> <p>OR</p> <p>4 SH of Electives from approved list may be substituted for the MSEI Capstone.</p>

\*\* not yet developed

### List of approved elective courses for the minor in Materials Science and Engineering Interdisciplinary

Elective courses counted towards the student's major may also be counted towards the minor. Eligible electives include courses in electrical and computer engineering, mechanical engineering, civil engineering, chemical engineering, chemistry and chemical biology, and physics.

#### Electrical and Computer Engineering

ECE U608	Nanotechnology	4SH
ECE U606	Integrated Circuit Fabrication	4SH

#### Chemical Engineering

CHE U634	Nanomaterials: Thin Films and Structures	4SH
CHE U619	Polymer Science	4SH
CHE U360 <sup>12</sup>	Biomaterials	4SH
CHE U608	Nanotechnology	4SH

#### Mechanical and Industrial Engineering

MIM U640	Mechanical Behavior and Processing of Materials	4SH
MIM TBA	Environmental Issues and Manufacturing Processes	4SH

<sup>1</sup> Core courses may be taken as part of the student's major.

<sup>2</sup> Courses CIV U260 and U261 are to be taken together. Students cannot choose one without taking the other.

<sup>3</sup> Electives may be selected from courses counted towards a student's major.

<sup>4</sup> The Materials Science and Engineering Interdisciplinary Capstone may be counted towards a student's major with the approval of the student's major department and the MSEI Executive Committee.

<sup>5</sup> 4 SH of electives can be substituted for the MSEI capstone. This does not relieve the student from completing the Capstone Design courses in his/her major department.

<sup>6</sup> The MSEI Executive Committee will consist of the authors of this proposal.

Chemistry and Chemical Biology

CHM U501 Inorganic Chemistry 4SH

CHM U687 Principles of Solid State Chemistry 4SH

Physics

PHY U614 Condensed Matter Physics 4SH

A.3 Materials Science and Engineering Interdisciplinary Capstone<sup>7</sup>

All students may choose to complete a 4 SH MSEI Capstone on a topic of materials science supervised in any department within the COE. The student must present a certification from the Capstone Design instructor indicating that the Capstone experience has sufficient MSE content to qualify as a MSEI Capstone. If the major department chooses not to endorse the MSEI Capstone, or the MSEI Executive Committee does not approve of the proposed Capstone project, then the students may take an additional 4 SH of elective courses listed above to fulfill the requirements of the minor.

For Additional Information and to establish a Plan of Study, please see:

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<sup>7</sup> The Materials Science and Engineering Capstone may be counted towards a student's major with the approval of the student's major department and the MSEI Executive Committee.

## When Classes are Offered:

## Core:

MIM U340	Introduction to Materials Science	4SH	Every Fall and Spring
ECE U392	Electronic Materials	4SH	Odd Springs
CIV U260/U261	Civil Engineering Materials/Lab	3SH/2SH	Every Fall
CHE U360	Biomaterials	4SH	To Be Developed

## Electives:

CHE U634	Nanomaterials: Thin Films and Structures	4SH	Odd Springs
CHE U608	Nanotechnology	4SH	Even Springs
CHE U619	Polymer Science	4SH	Irregular
ECE U608	Nanotechnology	4 SH	Even Springs
ECE U606	Integrated Circuit Fabrication	4SH	Odd Springs
MIM U640	Mechanical Behavior and Processing of Materials	4SH	Irregular
MIM TBA	Environmental Issues and Manufacturing Processes	4SH	To Be Developed
CHM U501	Inorganic Chemistry (Phys Chem 1/ChE Thermo 1 pre-requisite)	4SH	Every Spring
CHM U687	Principles of Solid State Chemistry (Inorganic prerequisite)	4SH	Every Fall
PHY U614	Condensed Matter Physics	4SH	Irregular