

# Materials Science and Engineering, Minor

The materials science and engineering minor is open to all students in the College of Engineering. The study of materials 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 buckyballs 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, usable solar cells to reduce our dependence on fossil fuels. There are many more examples of both existing technologies and current research areas involving materials science and engineering that impact everyday life both today and in the future.

This minor is for students 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 student a broad interdisciplinary program that includes a basic background in the relevant aspects of materials 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 materials 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.

## Minor Requirements

Complete all courses listed below unless otherwise indicated. Also complete any corequisite labs, recitations, clinicals, or tools courses where specified.

### Required Course

| Code    | Title                            | Hours |
|---------|----------------------------------|-------|
| ME 2340 | Introduction to Material Science | 4     |

### Electives

| Code   | Title | Hours |
|--|-------|-------|
| Complete three courses from the following disciplines: |       | 11-13 |

#### Bioengineering

|           |              |
|-----------|--------------|
| BIOE 5820 | Biomaterials |
|-----------|--------------|

#### Chemical Engineering

|           |  |
|-----------|--|
| CHME 5105 | Materials Characterization Techniques    |
| CHME 5160 | Drug Delivery: Engineering Analysis      |
| CHME 5631 | Biomaterials Principles and Applications |
| CHME 5632 | Advanced Topics in Biomaterials          |
| CHME 5683 | Introduction to Polymer Science          |

#### Civil and Environmental Engineering

|                            |  |
|----------------------------|--|
| CIVE 2260<br>and CIVE 2261 | Materials for the Built Environment<br>and Lab for CIVE 2260     |
| CIVE 5275                  | Life Cycle Assessment of Materials, Products, and Infrastructure |

#### Electrical and Computer Engineering

|           |   |
|-----------|---|
| EECE 3392 | Electronic Materials  |
| EECE 5606 | Micro- and Nanofabrication                                    |
| EECE 5670 | Sustainable Energy: Materials, Conversion, Storage, and Usage |

#### Materials Engineering

|           |  |
|-----------|--|
| MATL 5380 | Particulate Materials Processing   |
| MATL 6250 | Soft Matter (With Instructor permission)   |
| MATL 6270 | Principles, Devices, and Materials for Energy Storage and Energy Harvesting (With Instructor permission) |
| MATL 6285 | Structure, Properties, and Processing of Polymeric Materials (With Instructor Permission)                |

#### Mechanical and Industrial Engineering

|         |   |
|---------|---|
| ME 4630 | Ceramic Science and Engineering                 |
| ME 4640 | Mechanical Behavior and Processing of Materials |
| ME 5600 | Materials Processing and Process Selection      |

## 2 Materials Science and Engineering, Minor

|         |   |
|---------|---|
| ME 5620 | Fundamentals of Advanced Materials                    |
| ME 5640 | Additive Manufacturing                                |
| ME 5645 | Environmental Issues in Manufacturing and Product Use |

### Chemistry and Chemical Biology

|           |   |
|-----------|---|
| CHEM 3501 | Inorganic Chemistry                     |
| CHEM 5651 | Materials Chemistry of Renewable Energy |

Or any advisor-approved course or directed study

### Capstone Design Requirement

| Code  | Title  | Hours |
|---|--|-------|
| Complete one of the following: <sup>1</sup> |  |       |
| BIOE 4792                                   | Capstone Design 2                              | 4-5   |
| CHME 4703                                   | Chemical Process Design Capstone               |       |
| CIVE 4765                                   | Senior Design Project—Environmental            |       |
| CIVE 4767                                   | Senior Design Project—Structural               |       |
| CIVE 4768                                   | Senior Design Project—Transportation           |       |
| EECE 4792                                   | Electrical and Computer Engineering Capstone 2 |       |
| MEIE 4702                                   | Capstone Design 2                              |       |

### GPA Requirement

2.000 GPA required in the minor

<sup>1</sup> Students may complete 4 semester hours of elective coursework in place of the capstone design project (if major does not have a capstone design project requirement).