# Master of Science in Materials Science and Engineering, Plan B

Materials Science and Engineering (MSE) research is aimed at educating and training the next generation of thinkers to solve the biggest global challenges.

By fostering a multidisciplinary approach, MSE degree programs strive to endow students with the tools to strategically question current design paradigms and drive innovative materials and manufacturing solutions across a diverse range of sectors. Motivated by modern materials challenges in energy, computing, transportation, impact protection, robotics, and global health care, MSE programs’ comprehensive, experiential training is designed to equip graduates with a modernized skill set tailored to confront those challenges head-on.

The Plan B (coursework only) degree program is designed to engage students with:

- Active hands-on training on state of the art instrumentation and class time spent in commercial manufacturing labs.
- Enhanced educational and internship opportunities promoted through industry partnerships.
- A diverse core of faculty mentors driving advances in controlling structure at the nanoscale, predictive property modeling, high performance metal, polymer and ceramic composites, photovoltaics, and additive manufacturing.

The overall objective of the Master of Science in Materials Science and Engineering, Plan B, is to develop students to be science and engineering professionals who use their multidisciplinary problem solving skills to address global challenges in the field of materials science and engineering.

## Requirements

### Effective Fall 2017

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSE 501</td>
<td>Materials Technology Transfer</td>
<td>1</td>
</tr>
<tr>
<td>MSE 502A</td>
<td>Materials Science &amp; Engineering Methods: Materials Structure and Scattering</td>
<td>1</td>
</tr>
<tr>
<td>MSE 502B</td>
<td>Materials Science &amp; Engineering Methods: Computational Materials Methods</td>
<td>1</td>
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<tr>
<td>MSE 503</td>
<td>Mechanical Behaviors of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MSE 504</td>
<td>Thermodynamics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MSE 695</td>
<td>Independent Study</td>
<td>3</td>
</tr>
<tr>
<td>MSE 793</td>
<td>Professional Development Seminar</td>
<td>2</td>
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Select at least one course from the following:

- MSE 502C | Materials Science & Engineering Methods: Materials Microscopy                   | 1       |
- MSE 502D | Materials Science & Engineering Methods: Materials Spectroscopy                |         |
- MSE 502E | Materials Science & Engineering Methods: Bulk Properties and Performance       |         |

### Core Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 511</td>
<td>Solid State Chemistry</td>
<td></td>
</tr>
<tr>
<td>CHEM 517</td>
<td>Chemistry of Electronic Materials</td>
<td></td>
</tr>
<tr>
<td>ECE 574</td>
<td>Optical Properties in Solids</td>
<td></td>
</tr>
<tr>
<td>PH 531</td>
<td>Introductory Condensed Matter Physics</td>
<td></td>
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### Specialty Courses

Select at least 6 credits from the following:

- BIOM 570/MECH 570 | Bioengineering                                                       |         |
- BIOM 592 | Seminar                                                             |         |
- CBE 501 | Chemical Engineering Thermodynamics                                  |         |
- CBE 514 | Polymer Science and Engineering                                      |         |
- CHEM 515 | Polymer Chemistry                                                   |         |
- CHEM 550B | Materials Chemistry: Soft Materials                                  |         |
- CHEM 550C | Materials Chemistry: Nanomaterials                                  |         |
- CHEM 567 | Crystallographic Computation                                        |         |
- CHEM 569 | Chemical Crystallography                                            |         |
- CHEM 577 | Surface Chemistry                                                   |         |
- CIVE 560 | Advanced Mechanics of Materials                                      |         |
- CIVE 565 | Finite Element Method                                               |         |
- CIVE 662 | Foundations of Solid Mechanics                                       |         |
- CIVE 664 | Mechanics of Fatigue and Fracture                                    |         |
- ECE 505 | Nanostructures: Fundamentals and Applications                        |         |
- ECE 569/MECH 569 | Micro-Electro-Mechanical Devices                                    |         |
- ECE 673 | Thin Film Growth                                                    |         |
- GRAD 544 | Ethical Conduct of Research                                         |         |
- MATH 535 | Foundations of Applied Mathematics                                   |         |
- MATH 550/MATH 550 | Numerical Methods in Science and Engineering                        |         |
- MECH 525 | Cell and Tissue Engineering                                         |         |
- MECH 530 | Advanced Composite Materials                                        |         |
- MECH 531 | Materials Engineering                                               |         |
- MECH 532/MECH 532 | Materials Issues in Mechanical Design                               |         |
- MECH 573 | Structure and Function of Biomaterials                              |         |
- MECH 628 | Applied Fracture Mechanics                                          |         |
- MSE 505 | Kinetics of Materials                                               |         |
- PH 631  | Modern Topics in Condensed Matter Physics                            |         |
- PH 731  | Condensed Matter Theory                                             |         |

## Research and Teaching

The M.S. Plan B requires a minimum of 30 credit hours, some of which may be fulfilled with the following:
A minimum of 30 credits are required to complete this program.

1. A project/report will be required for satisfactory completion of MSE 695; complete a minimum of 3 credits.

2. Students must register for 1 credit of MSE 793 each of their first 2 semesters in the program.

3. CHEM 511, CHEM 517, ECE 574, and PH 531 can be used as specialty courses, if not used to fulfill core requirements.