# Materials Science and Engineering Curriculum

*Updated July 29, 2018 – GE Core in Red, Major in Black*

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Second Semester</th>
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<tbody>
<tr>
<td>160:159 Chemistry I for Engineers</td>
<td>GE 3</td>
</tr>
<tr>
<td>160:171 Intro to Experimentation</td>
<td>GE 1</td>
</tr>
<tr>
<td>355:101 Expository Writing</td>
<td>GE 3</td>
</tr>
<tr>
<td>640:151 Calculus I Math/Phys</td>
<td>GE 4</td>
</tr>
<tr>
<td>750:123 Analytical Physics IA</td>
<td>GE 2</td>
</tr>
<tr>
<td>440:100 Engineering Orientation Lec</td>
<td>GE 1</td>
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<tr>
<td><strong>Credits</strong></td>
<td><strong>17</strong></td>
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<tr>
<th>Third Semester</th>
<th>Fourth Semester</th>
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<tbody>
<tr>
<td>640:251 Multivariable Calculus</td>
<td>GE 4</td>
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<tr>
<td>750:227 Analytical Physics IIA</td>
<td>GE 3</td>
</tr>
<tr>
<td>750:229 Analytical Physics IIA Lab</td>
<td>GE 1</td>
</tr>
<tr>
<td>635:203 Intro to MSE</td>
<td>M 3</td>
</tr>
<tr>
<td>635:205 Crystal Chem &amp; Struct</td>
<td>M 3</td>
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<tr>
<td><strong>Credits</strong></td>
<td><strong>17</strong></td>
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<tr>
<th>Fifth Semester</th>
<th>Sixth Semester</th>
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<tbody>
<tr>
<td>635:305 Materials Microprocessing</td>
<td>M 3</td>
</tr>
<tr>
<td>635:307 Kinetics of Mat’l Processing</td>
<td>M 3</td>
</tr>
<tr>
<td>635:309 Characterization of Materials</td>
<td>M 3</td>
</tr>
<tr>
<td>635:314 Strength of Materials</td>
<td>M 3</td>
</tr>
<tr>
<td>635:353 Laboratory II</td>
<td>M 2</td>
</tr>
<tr>
<td><strong><strong>:</strong></strong> Elective (Dept/Tech)</td>
<td>M 3</td>
</tr>
<tr>
<td><strong><strong>:</strong></strong> Elective (Dept/Tech)</td>
<td>M 3</td>
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<tr>
<td><strong>Credits</strong></td>
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<tr>
<th>Seventh Semester</th>
<th>Eighth Semester</th>
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<tbody>
<tr>
<td>635:402 Senior MSE Lab II</td>
<td>M 3</td>
</tr>
<tr>
<td>(only one of 402/412 is required)</td>
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</tr>
<tr>
<td>635:412 MSE Eng Design I</td>
<td>M 3</td>
</tr>
<tr>
<td>635:403 MSE Seminar</td>
<td>M 1</td>
</tr>
<tr>
<td><strong><strong>:</strong></strong> Elective (Dept/Tech)</td>
<td>M 3</td>
</tr>
<tr>
<td><strong><strong>:</strong></strong> Elective (Dept/Tech)</td>
<td>M 3</td>
</tr>
<tr>
<td><strong><strong>:</strong></strong> Hum/SocSci Elective (300+)</td>
<td>GE 3</td>
</tr>
<tr>
<td><strong>Credits</strong></td>
<td><strong>16</strong></td>
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*Total Credits at Graduation: 128*
Electives

Aside from the Humanities/Social Science electives, the Materials Science and Engineering (MSE) program contains eight elective slots (4 Department, 3 Technical, and 1 General) that can be used to tailor your degree. You can concentrate in specific areas of MSE, dual major, or prepare for specialized professional training after graduation. Talk to us about your interests and we will help you identify the best possibilities. See Professor Wenzel for advice.

Department Electives (4)

Take 2, 3, or 4 Department Electives from this list…

- 635:312 Glass Engineering
- 635:360 Ceramics Engineering
- 635:361 Materials Science and Engineering of Polymers
- 635:362 Physical Metallurgy

...and select any remaining Department Elective(s) from this list:

- 635:320 Introduction to Nanomaterials
- 635:321 Structural, Mechanical & Chemical Applications of Nanostructures & Nanomaterials
- 635:322 Photonic, Electronic & Magnetic Applications of Nanostructures & Nanomaterials
- 635:405 Solar Cell Design & Processing
- 635:410 Biological Applications of Nanostructures & Nanomaterials
- 635:413 Materials Science & Engineering: Venture Analysis
- 635:416 Physical & Chemical Properties of Glass
- 635:440 Electrochemical Materials and Devices
- 635:505 Advanced Optical Materials

Technical Electives (3)

Your three technical electives may be selected from the Department Electives list or from the list below. If you wish to take a course not on this list (e.g. graduate courses or courses in other fields), apply to Professor Wenzel in writing explaining your rationale.

- 01:119: Biological Sciences: only 119:100-103, 131, 140, and 148
- 01:146: Cell Biology & Neurosciences: all except 146:302
- 01:160: Chemistry: all 160:3xx and 4xx
- 01:198: Computer Sciences: all except 198:105, 107, 110 and 170
- 01:447: Genetics & Microbiology: all except 447:302
- 01:460: Geological Sciences: all except 460:206
- 01:694: Molecular Biology & Biochemistry: all
- 01:750: Physics: 750:228/230 and all 750:3xx and 4xx
- 01:960: Statistics: all
- 11:115: Biochemistry: all 115:3xx and 4xx
- 11:126: Biotechnology: all
- 11:127: Bio-resource Engineering: all
- 11:375: Environmental Sciences: all
- 11:400: Food Sciences: only 400:201, 304, 401, and 411
- 11:628: Marine Sciences: all
- 11:670: Meteorology: all
Statistics

One of the following courses must be taken to satisfy the statistics requirement:

- 960:211  Statistics I
- 960:384  Intermediate Statistical Analysis
- 960:401  Basic Statistics for Research
- 960:490  Introduction to Experimental Design

Double Majoring

The MSE curriculum is quite flexible and permits double majoring in certain instances for students with AP credits or transfer credits.

Concentrations

The MSE Department presently has six areas of concentration in which you may specialize and receive a certificate upon graduation. These are highly relevant areas science and engineering that are favored by graduate schools and employers. See the following page. To receive a certificate in any one of these areas you must take at least three of the courses listed.

Questions on any aspect of the curriculum? Check with the Undergraduate Director:
Professor Wenzel
wenzel@rci.rutgers.edu
Room 231, McLaren Ceramics Building
(848) 445-5092
## The 6 Optional MSE Concentrations

*Enhance your MSE experience with a Concentration in one or more specific areas of interest described below.*

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Acceptable Courses (Choose 3)</th>
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</table>
| **Biomaterials** – Faculty coordinators: Professors Mann & Fabris. | • 01:119:101 General Biology I(3)**  
• 01:119:102 General Biology II(3)  
• 01:160:307 Organic Chemistry I (4)**  
• 01:694:214 Introduction to Molecular Biology Research(3)  
• 14:125:404 Introduction to Biomaterials (3)✓  
• 14:635:410 Biological Applications of Nanomaterials(3)✓  
Note: One course from each of the two groups marked with ** and ✓ is required. |
| **Electronic and Optical** – Faculty coordinators: Professors Harrington and Safari | • 14:635:322 Photonic, Electronic and Magnetic Applications of Nanostructures and Nanomaterials (3)  
• 14:635:405 Solar Cell Design and Processing (3)  
• 14:635:413 Solar Technology Venture Analysis (3)  
• 14:332:466 Opto-Electronic Devices (3)  
• 14:635:505 Advanced Optical Materials (3)  
• 12:750:305 Modern Optics (3)  
• 12:750:406 Introductory Solid State Physics (3) |
| **Energy Conversion and Storage** – Faculty coordinators: Professors Klein and Amatucci | • 11:375:322 (F) Energy Technology and its Environmental Impact (3)  
• 14:635:405 (F) Solar Cell Design and Processing (3)  
• 14:332:402 (S) Sustainable Energy: Choosing Among Options (3)  
• 14:635:440 (S) Electrochemical Devices (3)  
• 14:332:361 (S) Electronic Devices (pre-requisite is Principles of Electrical Engineering 14:332:222) (3)  
• 14:332:460 (S) Power Electronics (pre-requisite is Electronic Devices 14:332:361) (3) |
| **Nanomaterials** – Faculty coordinators: Professors O’Carroll and Klein | • 14:635:320 Introduction to Nanomaterials (3)  
• 14:635:410 Biological Applications of Nanomaterials (3)  
• 16:635:604 Introduction to Nanoscience and Nanotechnology (3)  
• 16:635:321 Structural, Mechanical, and Chemical Properties of Nanomaterials. (3) |
| **Polymers** – Faculty coordinators: Professors Lehman and Wenzel | • 01:160:307 Organic Chemistry I (4)  
• 14:635:361 Materials Science and Engineering of Polymers  
• 16:155:551 Polymer Science and Engineering  
• 14:440:301 Introduction to Packaging  
• Polymer Engineering or Science Elective (TBD) |
Packaging Materials –
Faculty coordinators: Professors Lehman and Nosker.

- 14:635:312 Glass Engineering
- 14:635:361 Polymer Engineering
- 14:635:362 Physical Metallurgy
- 14:440:301 Intro to Packaging 3
- 14:440:302 CAD in Packaging 3
- Other Packaging Engineering or Science Elective (TBD)

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