Materials Science and Engineering, B.S.

Begin Campus: Any Penn State Campus
End Campus: University Park

Degree Requirements
For the Bachelor of Science degree in Materials Science and Engineering, a minimum of 131 credits is required:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Education</td>
<td>45</td>
</tr>
<tr>
<td>Requirements for the Major</td>
<td>110</td>
</tr>
<tr>
<td>24 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses; 6 credits of GQ courses; 9 credits of GWS courses.</td>
<td></td>
</tr>
</tbody>
</table>

Note: The Accreditation Board for Engineering and Technology (ABET) does not permit the use of skills courses to satisfy the Arts category of General Education.

Requirements for the Major
To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 110</td>
<td>Chemical Principles I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 111</td>
<td>Experimental Chemistry I</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 113</td>
<td>Experimental Chemistry II</td>
<td>1</td>
</tr>
<tr>
<td>CHEM 202</td>
<td>Fundamentals of Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CMPSC 200</td>
<td>Programming for Engineers with MATLAB</td>
<td>3</td>
</tr>
<tr>
<td>EMGL 100S</td>
<td>Earth and Mineral Sciences First-Year Seminar</td>
<td>3</td>
</tr>
<tr>
<td>ENGL 202C</td>
<td>Effective Writing: Technical Writing</td>
<td>3</td>
</tr>
<tr>
<td>IE 424</td>
<td>Process Quality Engineering</td>
<td>3</td>
</tr>
<tr>
<td>MATH 140G</td>
<td>Calculus with Earth and Mineral Sciences Applications I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 141G</td>
<td>Calculus with Earth and Mineral Sciences Applications II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 220</td>
<td>Matrices</td>
<td>2</td>
</tr>
<tr>
<td>MATH 231</td>
<td>Calculus of Several Variables</td>
<td>2</td>
</tr>
<tr>
<td>MATH 251</td>
<td>Ordinary and Partial Differential Equations</td>
<td>4</td>
</tr>
<tr>
<td>MATSE 112</td>
<td>Applied Materials Chemistry for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>MATSE 413</td>
<td>Solid-State Materials</td>
<td>3</td>
</tr>
<tr>
<td>MATSE 419</td>
<td>Computational Materials Science and Engineering</td>
<td>3</td>
</tr>
<tr>
<td>MATSE 436</td>
<td>Mechanical Properties of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MATSE 460</td>
<td>Introductory Laboratory in Materials</td>
<td>1</td>
</tr>
<tr>
<td>MATSE 462</td>
<td>General Properties Laboratory in Materials</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 211</td>
<td>General Physics: Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>General Physics: Electricity and Magnetism</td>
<td>4</td>
</tr>
</tbody>
</table>

Prescribed Courses: Require a grade of C or better

Additional Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATSE 201</td>
<td>Introduction to Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>MATSE 202</td>
<td>Introduction to Polymer Materials</td>
<td>3</td>
</tr>
<tr>
<td>MATSE 400</td>
<td>Crystal Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>MATSE 401</td>
<td>Thermodynamics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>MATSE 402</td>
<td>Materials Process Kinetics</td>
<td>3</td>
</tr>
<tr>
<td>MATSE 430</td>
<td>Materials Characterization</td>
<td>3</td>
</tr>
<tr>
<td>MATSE 492W</td>
<td>Materials Engineering Methodology and Design</td>
<td>3</td>
</tr>
</tbody>
</table>

Synthesis and Processing
Select 3-6 credits of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATSE 411</td>
<td>Processing of Ceramics</td>
<td></td>
</tr>
<tr>
<td>MATSE 422</td>
<td>Thermochemical Processing</td>
<td></td>
</tr>
<tr>
<td>MATSE 425</td>
<td>Processing of Metals</td>
<td></td>
</tr>
<tr>
<td>MATSE 441</td>
<td>Polymeric Materials I</td>
<td></td>
</tr>
<tr>
<td>MATSE 448</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATSE 450</td>
<td>Synthesis and Processing of Electronic and Photonic Materials</td>
<td>3</td>
</tr>
</tbody>
</table>

Structure and Characterization
Select 3-6 credits of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATSE 410</td>
<td>Phase Relations of Materials</td>
<td></td>
</tr>
<tr>
<td>MATSE 415</td>
<td>Introduction to Glass Science</td>
<td></td>
</tr>
<tr>
<td>MATSE 421</td>
<td>Corrosion Engineering</td>
<td></td>
</tr>
<tr>
<td>MATSE 444</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATSE 445</td>
<td>Thermodynamics, Microstructure, and Characterization of Polymers</td>
<td>3</td>
</tr>
<tr>
<td>MATSE 455</td>
<td>Properties and Characterization of Electronic and Photonic Materials</td>
<td>3</td>
</tr>
</tbody>
</table>

Properties
Select 3-6 credits of the following:

<table>
<thead>
<tr>
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<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATSE 412</td>
<td>Thermal Properties of Materials</td>
<td></td>
</tr>
<tr>
<td>MATSE 417</td>
<td>Electrical and Magnetic Properties</td>
<td></td>
</tr>
<tr>
<td>MATSE 435</td>
<td>Optical Properties of Materials</td>
<td></td>
</tr>
<tr>
<td>MATSE 446</td>
<td>Mechanical and Electrical Properties of Polymers and Composites</td>
<td>3</td>
</tr>
<tr>
<td>MATSE 447</td>
<td>Rheology and Processing of Polymers</td>
<td></td>
</tr>
</tbody>
</table>

Processing Laboratory
Select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATSE 463</td>
<td>Characterization and Processing of Electronic and Photonic Materials Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>MATSE 468</td>
<td>Ceramics Laboratory III</td>
<td></td>
</tr>
<tr>
<td>MATSE 472</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MATSE 474</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Senior Capstone Experience

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATSE 493W</td>
<td>Materials Science and Engineering Multidisciplinary Capstone Design Project</td>
<td>3</td>
</tr>
<tr>
<td>or MATSE 494W</td>
<td>Research and Design Senior Project</td>
<td></td>
</tr>
</tbody>
</table>

Supporting Courses and Related Areas
Select 12 credits of approved Science or Engineering Elective courses in consultation with adviser

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>
The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 or ENGL 202C can be substituted for EMSC 100S.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (https://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required and Inter-Domain courses do not meet this requirement.)
- Quantification (GQ): 6 credits
- Writing and Speaking (GWS): 9 credits

Breadth in the Knowledge Domains (Inter-Domain courses do not meet this requirement.)
- Arts (GA): 3 credits
- Health and Wellness (GHW): 3 credits
- Humanities (GH): 3 credits
- Social and Behavioral Sciences (GS): 3 credits
- Natural Sciences (GN): 3 credits

Integrative Studies
- Inter-Domain Courses (Inter-Domain): 6 credits

Exploration
- GN, may be completed with Inter-Domain courses: 3 credits
- GA, GH, GN, GS, Inter-Domain courses. This may include 3 credits of World Language course work beyond the 12th credit level or the requirements for the student’s degree program, whichever is higher: 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (https://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80)). For more information, check the Suggested Academic Plan for your intended program.