MATERIALS SCIENCE MAJOR

Students must also complete the Undergraduate Registration Requirement (https://catalogs.northwestern.edu/undergraduate/requirements-policies/undergraduate-registration-requirement/) and the degree requirements of their home school.

Requirements include foundation courses in mathematics and science and advanced electives. Course descriptions for materials science courses are listed in the McCormick School (https://catalogs.northwestern.edu/undergraduate/engineering-applied-science/materials-science-engineering/) chapter of this catalog.

Course | Title
--- | ---
**Program Courses (13 units)**
Laboratory components of general and organic chemistry courses require separate registration and bear separate credit; see the chemistry section for details.

5 core courses:
- MAT_SCI 201-0 Introduction to Materials
  or MAT_SCI 301-0 Materials Science Principles
- MAT_SCI 315-0 Phase Equilibria & Diffusion of Materials
- MAT_SCI 316-1 Microstructural Dynamics
  & MAT_SCI 316-2 and Microstructural Dynamics
- MAT_SCI 351-1 Introductory Physics of Materials

5 courses in the chosen track:
- General Materials Track (p. 2)
- Soft Materials Track (p. 2)

3 advanced electives:
At least 1 in materials science chosen from:
- MAT_SCI 318-0 Materials Selection
- MAT_SCI 332-0 Mechanical Behavior of Solids
- MAT_SCI 336-0 Chemical Synthesis of Materials
- MAT_SCI 337-0 Conducting Polymers
- MAT_SCI 340-0 Ceramic Processing
- MAT_SCI 351-2 Introductory Physics of Materials
- MAT_SCI 353-0 Bioelectronics
- MAT_SCI 354-0 Bioelectronics Lab
- MAT_SCI 355-0 Electronic Materials
- MAT_SCI 357-0 Nanomagnetic Materials for Information Storage
- MAT_SCI 358-0 Modeling and Simulation in Materials Science and Engineering
- MAT_SCI 360-0 Introduction to Electron Microscopy
- MAT_SCI 361-0 Crystallography & Diffraction
- MAT_SCI 370-0 Biomaterials
- MAT_SCI 371-0 Biominerals: Hierarchical Architecture & Function
- MAT_SCI 376-0 Nanomaterials
- MAT_SCI 380-0 Intro Surface Science & Spectroscopy
- MAT_SCI 381-0 Materials for Energy-Efficient Technology
- MAT_SCI 382-0 Electrochemical Energy Materials and Devices
- MAT_SCI 385-0 Electronic and Thermal Properties of Materials
- MAT_SCI 387-0 Solar Energy Conversion
- MAT_SCI 390-0 Materials Design
- MAT_SCI 391-0 Process Design
- MAT_SCI 397-0 Special Topics in Materials Science and Engineering

At least 1 in another department chosen from the following:

CHEM 215-3 Advanced Organic Chemistry
CHEM 307-0 Materials and Nanochemistry
CHEM 333-0 Inorganic Chemistry
CHEM 342-2 Quantum Mechanics and Spectroscopy
CHEM 342-3 Kinetics and Statistical Thermodynamics
EARTH 300-0 Earth and Planetary Materials
MATH 250-0 Elementary Differential Equations
MATH 351-0 or MATH 381-0 Fourier Analysis and Boundary Value Problems for ISP
PHYSICS 332-0 Statistical Mechanics
PHYSICS 333-1 Advanced Electricity & Magnetism
PHYSICS 333-2 Advanced Electricity & Magnetism
PHYSICS 337-0 Physics of Condensed Matter
PHYSICS 339-3 Particle and Nuclear Physics
PHYSICS 357-0 Optics Laboratory
PHYSICS 367-0 Particle and Nuclear Physics
PHYSICS 368-0 and Advanced General Physics

Foundations in Mathematics and Science (Units depend on chemistry and mathematics sequences taken.)

- MATH 220-1 Single-Variable Differential Calculus
  & MATH 220-2 and Single-Variable Integral Calculus
  or MATH 218-1 Single-Variable Calculus with Precalculus
  & MATH 218-2 and Single-Variable Calculus with Precalculus
  & MATH 218-3 and Single-Variable Calculus with Precalculus

- MATH 230-1 Multivariable Differential Calculus
  & MATH 230-2 and Multivariable Integral Calculus
  & MATH 240-0 and Linear Algebra
  or MATH 281-1 Accelerated Mathematics for ISP: First Year
  & MATH 281-2 and Accelerated Mathematics for ISP: First Year
  & MATH 281-3 and Accelerated Mathematics for ISP: First Year
  or MATH 285-1 Accelerated Mathematics for MMSS: First Year
  & MATH 285-2 and Accelerated Mathematics for MMSS: First Year
  & MATH 285-3 and Accelerated Mathematics for MMSS: First Year
  or MATH 290-1 MENU: Linear Algebra and Multivariable Calculus
  & MATH 290-2 and MENU: Linear Algebra and Multivariable Calculus
  & MATH 290-3 and MENU: Linear Algebra and Multivariable Calculus
  or MATH 291-1 MENU: Intensive Linear Algebra and Multivariable Calculus
  & MATH 291-2 and MENU: Intensive Linear Algebra and Multivariable Calculus
  & MATH 291-3 and MENU: Intensive Linear Algebra and Multivariable Calculus

- CHEM 110-0 Quantitative Problem Solving in Chemistry
  & CHEM 130-0 and General Chemistry 1
  & CHEM 132-0 and General Chemistry 2
  or CHEM 151-0 Accelerated General Chemistry 1
  & CHEM 152-0 and Accelerated General Chemistry 2
  or CHEM 171-0 Advanced General Inorganic Chemistry
  & CHEM 172-0 and Advanced General Physical Chemistry

- PHYSICS 135-1 General Physics
  & PHYSICS 135-2 and General Physics
  & PHYSICS 135-3 and General Physics
  or PHYSICS 125-1 General Physics ISP
  & PHYSICS 125-2 and General Physics for ISP
  & PHYSICS 125-3 and General Physics for ISP

Students in the soft materials track who are interested in biomaterials and/or medicine are encouraged to take additional courses in biology.
1 MAT_SCI 395-0 Special Topics in Materials Science and Engineering may count only with permission of the director of undergraduate studies.

**Tracks**

**General Materials Track**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 215-1</td>
<td>Organic Chemistry I</td>
</tr>
<tr>
<td>CHEM 342-1</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>or MAT_SCI 314-0</td>
<td>Thermodynamics of Materials</td>
</tr>
<tr>
<td>MAT_SCI 331-0</td>
<td>Soft Materials</td>
</tr>
</tbody>
</table>

2 courses chosen from:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT_SCI 332-0</td>
<td>Mechanical Behavior of Solids</td>
</tr>
<tr>
<td>MAT_SCI 351-2</td>
<td>Introductory Physics of Materials</td>
</tr>
<tr>
<td>MAT_SCI 361-0</td>
<td>Crystallography &amp; Diffraction</td>
</tr>
</tbody>
</table>

At least 1 course in another department

**Soft Materials Track**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 215-1</td>
<td>Organic Chemistry I</td>
</tr>
<tr>
<td>&amp; CHEM 215-2</td>
<td>Organic Chemistry II</td>
</tr>
<tr>
<td>or CHEM 212-1</td>
<td>Organic Chemistry</td>
</tr>
<tr>
<td>&amp; CHEM 212-2</td>
<td>Organic Chemistry</td>
</tr>
<tr>
<td>CHEM 342-1</td>
<td>Thermodynamics</td>
</tr>
<tr>
<td>or MAT_SCI 314-0</td>
<td>Thermodynamics of Materials</td>
</tr>
<tr>
<td>MAT_SCI 331-0</td>
<td>Soft Materials</td>
</tr>
<tr>
<td>MAT_SCI 370-0</td>
<td>Biomaterials</td>
</tr>
<tr>
<td>or BMD_ENG 343-0</td>
<td>Biomaterials and Medical Devices</td>
</tr>
</tbody>
</table>

**Honors in Materials Science**

Seniors who have done outstanding work in the classroom and research laboratory may be eligible for graduation with honors in materials science. To be considered, a student must meet minimum GPA requirements, complete 2 units of research (see table), and complete a written research report.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 units of research selected from:</td>
<td></td>
</tr>
<tr>
<td>CHEM 398-0</td>
<td>Undergraduate Seminar</td>
</tr>
<tr>
<td>CHEM 399-0</td>
<td>Independent Study</td>
</tr>
<tr>
<td>MAT_SCI 396-1</td>
<td>Senior Project in Materials Science and Engineering</td>
</tr>
<tr>
<td>MAT_SCI 396-2</td>
<td>Senior Project in Materials Science and Engineering</td>
</tr>
<tr>
<td>MAT_SCI 394-0</td>
<td>Honors Project in Materials Science</td>
</tr>
<tr>
<td>MAT_SCI 399-0</td>
<td>Projects</td>
</tr>
<tr>
<td>PHYSICS 398-0</td>
<td>Independent Thesis Research</td>
</tr>
<tr>
<td>PHYSICS 399-0</td>
<td>Independent Study</td>
</tr>
</tbody>
</table>

These 2 units are neither required for nor counted toward the major. Students who intend to submit a senior research report should send an e-mail including the name of the research adviser to the director of undergraduate studies by fall of senior year.

Students whose theses and grades meet program criteria are recommended to the college for graduation with honors. For more information consult the program director and see Honors in the Major (https://catalogs.northwestern.edu/undergraduate/arts-sciences/#academicoptionstext).