## Materials Minor

Montana State University, Bozeman, offers a non-teaching minor in Materials Science & Engineering called the Minor in Materials. This minor provides courses from a variety of disciplines which are relevant to synergies of science and engineering in polymer, metallic, ceramic, hybrid, and composite materials for both structural and functional application. The minor requires a minimum of 32 credits comprised of 14 credits of required coursework (or equivalent) followed by 18 credits of elective coursework. EMAT 350 Engineering Materials is the cornerstone, foundational course for the Minor in Materials and is a required core class.

Students seeking the Minor in Materials must satisfy the core and additional course requirements, 32 credits total, as outlined below:

### Required Pre-requisite Courses
(credits not counted towards minor):
- M 171Q  Calculus I
- M 172  Calculus II
- PHSX 220  Physics I with Calculus
- PHSX 222  Physics II with Calculus
- CHMY 141  College Chemistry I

### Required Courses
(or equivalent courses as approved by the certifying officer):
- EMEC 250  Mechanical Engineering Materials 3
- EMAT 252  Materials Struct and Prop Lab 1
- EMAT 350  Engineering Materials 3
- EMEC 320  Thermodynamics I 3
- ETME 215  Manufacturing Processes 3
- ETME 216  Manufacturing Process Laboratory 1

These pre-requisite courses and required courses represent the core fundamentals of materials science and engineering which are applicable to students in the College of Engineering in addition to Physics and Chemistry. Students pursuing a BS in Engineering or the Physical Sciences will have to take 18 additional course credits (6 courses) out of the list below to obtain a Minor in Materials which may also serve as electives in the student’s major. Other courses may also be approved by the certifying officer with a written request detailing the merit of the course.

### Additional Courses
Choose six from the following: 18
- CHMY 371  Physical Chemistry:Quantum Chemistry and Spectroscopy I
- CHMY 373  Physical Chemistry - Kinetics and Thermodynamics
- CHMY 401  Advanced Inorganic Chemistry
- ECHM 405  Sustainable Energy
- ECHM 424  Transport Analysis
- ECHM 452  Advanced Engineering Materials
- EMAT 460  Polymeric Materials
- EMAT 461  Friction and Wear of Materials
- EMAT 462  Manufacturing of Composites
- EMAT 463  Composite Materials
- EMAT 464  Biomedical Materials Engineering
- EMAT 550  Failure of Materials
- EMAT 552  Advanced Ceramics
- EMAT 553  Advanced Composite Materials
- EMEC 444  Mech Behavior of Materials

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<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>EMEC 465</td>
<td>Bio-inspired Engineering</td>
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<tr>
<td>EMEC 467</td>
<td>Micro-Electromechanical Systems</td>
<td></td>
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<tr>
<td>EMEC 565</td>
<td>Smart Structures</td>
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<tr>
<td>PHSX 441</td>
<td>Solid State Physics *</td>
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**Total Credits** 32

* Course pre-requisites not included in the lists above do not count towards the 18 credits.