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 172Q 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 465 Bio-inspired Engineering
- EMAT 466 Polymer Materials
- EMAT 467 Micro-Electromechanical Systems
- EMAT 468 Manufacturing of Composites
- EMAT 469 Composite Materials
- EMAT 470 Advanced Composite Materials
- EMAT 550 Advanced Ceramics
- EMAT 553 Advanced Composite Materials

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMEC 444</td>
<td>Mech Behavior of Materials</td>
</tr>
<tr>
<td>EMEC 465</td>
<td>Bio-inspired Engineering</td>
</tr>
<tr>
<td>EMEC 467</td>
<td>Micro-Electromechanical Systems</td>
</tr>
<tr>
<td>EMEC 565</td>
<td>Smart Structures</td>
</tr>
<tr>
<td>PHSX 441</td>
<td>Solid State Physics</td>
</tr>
<tr>
<td>PHSX 442</td>
<td>Novel Materials for Physics/Engineering</td>
</tr>
</tbody>
</table>

Total Credits 32

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