Course Catalog description:
Our high-technology world is driven forward by advances in materials chemistry. This class will discuss some of the materials that underpin these technologies, as well as some of the novel classes of materials that are being developed for future applications. The course will cover the synthesis, structures, and properties of advanced materials, focusing on a range of topics with current societal importance (e.g. energy, computers, nanoscience, etc.). Specific topics may include batteries, fuel cells, catalysts, metals, semiconductors, superconductors, magnetism, and polymers.

PRE- OR COREQUISITE(S): CHE 375 or Permission of the instructor


<table>
<thead>
<tr>
<th>COURSE LEARNING OUTCOMES</th>
<th>SOS</th>
<th>ASSESSMENT TOOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn synthesis, structures, and properties of advanced materials</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COURSE TOPICS
Week 1-2: Review of basic solid state chemistry and crystallography – packing in ionic solids, lattices and unit cells, symmetry (local and translational)
Week 3: Basics of structure solution (diffraction)
Week 4-5: Basics of Band Theory. Insulators, metals, semiconductors, conductors and superconductors
Week 6: Effects of unpaired electrons: Magnetic properties. Ferromagnets, antiferromagnets and ferrimagnets.
Week 9: Intercalation chemistry: Batteries
Week 10: Porous structures and surfaces: separations and catalysis
Week 11: Optical properties: How materials interact with light. Solar cells, photocopiers
Week 12: Nanoparticles: Quantum confinement effects, optical properties etc.
Week 13: Polymers – structures and properties
CLASS/ LABORATORY SCHEDULE
Determined by the Chemistry Department

CURRICULUM
This course contributes 3 credit hours toward meeting the required 48 hours of engineering topics.

STUDENT OUTCOMES (SCALE 1-3):

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 – Strongly supported  2 – Supported  1- Minimally supported

LEAD COORDINATOR(S) WHO PREPARED THIS DESCRIPTION AND DATE OF PREPARATION: