MSE 231: The Science and Engineering of Materials
TR 9:20-10:50 HSC116

Dr. Craig L. Caylor
office hours: MTWF 2:00-3:00
Hoyt 122       Ext. -7202       caylorcl@westminster.edu

Pre-requisite: PHY151 or CHE117

A survey of fundamental concepts and approaches in the study of materials, dealing with atomic structure, mechanical properties, and thermodynamics of materials, along with analysis of specific categories of materials. Likely scope of the course is Chapters 2-12, 19, 20.

Outcomes:

1. Students will be able to describe the structure of materials at the level of the atom, arrangements of atoms, nanostructure, microstructure, and macrostructure.
2. Students will be able to perform calculations relating structural features to the observable properties of materials.
3. Students will be able to relate the mobility of atoms and ions to the observable properties of materials.
4. Students will be able to explain relationships between stress and strain for different materials, perform calculations involving stress and strain, and relate these factors to the observable properties of materials.
5. Students will be able to extract information from the phase diagrams of materials and compute material characteristics from those phase diagrams.
6. Students will be able to explain the key ideas in the behaviors of ceramic materials, polymeric materials, electronic materials, and magnetic materials. Students will be able to perform calculations to find a quantitative description of those behaviors.

Assessment:

Students will be assigned homework problems for each chapter and will take regularly-scheduled exams.

Grading:

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>35%</td>
<td>A  93-100%</td>
<td>C   73-77%</td>
</tr>
<tr>
<td>Exams</td>
<td>65%</td>
<td>A- 90-93%</td>
<td>C- 70-73%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B+ 87-90%</td>
<td>D+ 67-70%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B  83-87%</td>
<td>D  63-67%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B- 80-83%</td>
<td>D- 60-63%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C+ 77-80%</td>
<td>F &lt;60%</td>
</tr>
</tbody>
</table>
Assignment details:

Homework problems will be assigned for each chapter. Your diligent efforts toward answering assigned questions are essential for understanding each chapter’s materials and for developing and practicing problem-solving skills. Quantitative homework solutions should be more than just a string of equations. In each problem, you should begin with the most fundamental principle(s) you are applying. Logically coherent sentences to describe your thinking should accompany any equations you use. Each step should be clearly explained. Qualitative/descriptive homework questions should present logical reasoning. Those are the standards that will be expected on your exams.

There will be four exams. You should expect exams to feature both quantitative problems to solve and qualitative/descriptive analyses. Your grade for exam problems will depend on your application of correct principles, your use of correct mathematical processes, and the clarity and completeness of your solutions/answers. The last exam will be scheduled during our normal final exam period and will be cumulative. Some exams may have take-home components as well as in-class components.

Students are encouraged to meet with me about homework to obtain guidance. Students should feel free to consult with each other on homework problems. Students should not feel free to copy work from each other. If you work with others on a homework assignment, include “I worked with…” and their names at the top of the homework assignment.

Students are not permitted to consult other sources (e.g. instructors’ solution manuals or online answer repositories) in working on any assignments. Students are not permitted to consult other sources to “check” their work. Submitting others’ work as your own (including work from online sources) is a violation of Westminster College’s Academic Integrity Policy and will, if discovered, lead to a letter to the Dean and a failing grade for the course. To review Westminster’s policy, see the current WC catalog, available online at https://my.westminster.edu/ICS/Campus_Life/Campus_Groups/Student_Affairs/