

MSE 201: Materials Science

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| <i>Course description:</i> | Structure of materials, phase equilibrium, phase transformations, and mechanical properties |
| <i>Number of credits:</i> | 3 |
| <i>Course Coordinator:</i> | Scott Beckman |
| <i>Prerequisites by course:</i> | Chem 105; Physics 201 or concurrent enrollment |
| <i>Prerequisites by topic:</i> | <ol style="list-style-type: none">1. Basic knowledge of thermodynamics, organic and inorganic chemical structures2. Electron configuration and structures leading to valence in atoms |
| <i>Postrequisites:</i> | ME 310: Manufacturing Processes MSE 320: Materials Structure – Properties Laboratory MSE 321: Materials Characterization MSE 401: Metallic Materials MSE 402: Polymeric Materials MSE 403: Ceramic Materials MSE 413: Mechanics of Solids |
| <i>Textbooks/other required materials:</i> | <ol style="list-style-type: none">1. Callister, W. <i>Materials Science & Engineering: An Introduction</i>. Wiley, 2010 |
| <i>Course objectives:</i> | <ol style="list-style-type: none">1. Survey of different types of materials and materials science: metals, ceramics, polymers, composites, and materials selection.2. Develop a structure-properties perspective.3. Understand the physical and mechanical properties of materials through the basic nature of their bonds. |
| <i>Topics covered:</i> | <ol style="list-style-type: none">1. Characterizing the periodic table from a materials perspective: metals, non-metals, and semiconductors.2. Primary and secondary bonding in materials.3. Metallic/ceramic crystal systems.4. Defects in crystal systems and impact on materials properties.5. Diffusion and diffusion mechanisms.6. Phase diagram reactions and the kinetics of heat treatments.7. Testing and mechanical characterization of all materials.8. Ferrous and non-ferrous metals for engineering applications.9. Glass and ceramic materials for engineering applications.10. Polymers in engineering applications.11. Composites for engineering applications.12. Basic concepts in corrosion. |
| <i>Expected student outcomes:</i> | <ol style="list-style-type: none">1. Be able to relate the mechanical qualities of any material to the type of primary or secondary bonding present.2. Understand the basic concepts of stiffness, hardness, toughness, ductility, fatigue, resiliency, and how these qualities are measured for all materials.3. Effects of structure and defects on mechanical properties of solids.4. Kinetic processes in materials.5. Fabrication and processing of engineering materials.6. Be able to interpret a phase diagram and apply the Lever Law.7. Develop a basic understanding of polymer matrix, metal matrix and ceramic matrix composite systems. |

Class schedule: Three 50-minute lecture sessions per week, for one semester

Laboratory schedule: None

Contribution to meeting the professional component: Engineering Topics

Relationship of course to program objectives: Meets:
1. School of MME Educational Objectives: 1, 2, 3
2. ABET, Criterion 3 Program Outcomes: 1, 7
3. School of MME Program Outcomes: 1, 7, 8, 9

Prepared by: Andrea Butcherite and Dr. Scott Beckman

Date: May 30, 2018

POLICIES

A. Reasonable Accommodation (the nature of the particular course determines which one applies):

- **Pullman Campus.** Reasonable accommodations are available for students with a documented disability. If you have a disability and need accommodations to fully participate in this class, please either visit or call the Access Center (Washington Building 217; 509-335-3417) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.
- **WSU Online Course.** Reasonable accommodations are available in online classes for students with a documented disability. All accommodations must be approved through your WSU Disability Services office. If you have a disability and need accommodations, we recommend you begin the process as soon as possible. For more information contact a Disability Specialist on your home campus: Pullman or WSU Online (<http://accesscenter.wsu.edu>), Spokane (<http://spokane.wsu.edu/students/current/studentaffairs/disability/>), Tri-Cities (<http://www.tricity.wsu.edu/disability>), Vancouver (<http://studentaffairs.vancouver.wsu.edu/student-resource-center/disability-services>).

B. Academic Integrity

WSU expects all students to behave in a manner consistent with its high standards of scholarship and conduct. Students are expected to uphold these standards both on and off campus and acknowledge the university's authority to take disciplinary action. The Standards of Conduct for Students can be found at <http://conduct.wsu.edu>.

C. WSU Safety

WSU is committed to maintaining a safe environment for its faculty, staff, and students. Safety is the responsibility of every member of the campus community and individuals should know the appropriate actions to take when an emergency arises. In support of our commitment to the safety of the campus community the University has developed a Campus Safety Plan, <http://safetyplan.wsu.edu>. It is highly recommended that you visit this web site as well as the University emergency management web site at <http://oem.wsu.edu/> to become familiar with the information provided.