

MSE 403: Ceramic Materials

Course description: Processing, characteristics, microstructure and properties of ceramic materials.

Number of credits: 3

Course Coordinator: John McCloy

Prerequisites by course: MSE 201

- Prerequisites by topic:*
1. Basic knowledge of thermodynamics.
 2. Elementary crystallography and crystal structure.
 3. Mechanical behavior of materials.

Postrequisites: None

Textbooks/other required materials:

1. Carter, C.B. and Norton, M.G. *Ceramic Materials Science and Engineering*, Springer, 2007.

- Course objectives:*
1. Review of crystallography and crystal structure.
 2. Review of structure of atoms, molecules and bonding in ceramics.
 3. Discussion on structure of ceramics.
 4. Effects of structure on physical properties.
 5. Ceramic Phase diagrams.
 6. Discussion on defects in ceramics.
 7. Introduction to glass.
 8. Discussion on processing of ceramics.
 9. Introduction to sintering and grain growth.
 10. Introduction to mechanical properties of ceramics.
 11. Introduction to electrical properties of ceramics.
 12. Introduction to bioceramics.
 13. Introduction to magnetic ceramics.

- Topics covered:*
1. Introduction to crystal structure and crystallography.
 2. Fundamentals of structure of atoms.
 3. Structure of ceramics and its influence on properties.
 4. Binary and ternary phase diagrams.
 5. Point defects in ceramics.
 6. Glass and glass-ceramic composites.
 7. Ceramics processing and sintering.
 8. Mechanical properties of ceramics.
 9. Electrical properties of ceramics.
 10. Bio-ceramics.
 11. Ceramic magnets.

- Expected student outcomes:*
1. Knowledge of crystal structure of ceramics.
 2. Knowledge of structure-property relationship in ceramics.
 3. Knowledge of the defects in ceramics (Point defects).
 4. Knowledge of glass and glass-ceramic composite materials.
 5. Introductory knowledge on the processing of bulk ceramics.
 6. Applications of ceramic materials in structural, biological and electrical components.

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. School of MME program outcomes: (a), (g), (i), (j), (k)
3. ABET EC2000, Criterion 3 program outcomes: (a), (g), (i), (j), (k)

Prepared by: M.G. Norton

Date: September 18, 2014

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.