MSE 403: Ceramic Materials

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

Number of credits: 3. This course is required.

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: None

Reference books:

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.
5. Point defects in ceramics.
7. Ceramics processing and sintering.
8. Mechanical properties of ceramics.
11. Ceramic magnets.

**Expected learning 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).
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 student outcomes:**

3 strongly supported; 2 supported; 1 minimally supported

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**Prepared by:** Andrea Butcherite and Dr. John McCloy  
**Date:** May 30, 2018