

MSE 333: Ceramic Materials

<i>Course description:</i>	Processing, characteristics, microstructure and properties of ceramic materials.
<i>Number of credits:</i>	3. This course is required.
<i>Course Coordinator:</i>	Susmita Bose
<i>Prerequisites by course:</i>	MSE 201
<i>Prerequisites by topic:</i>	<ol style="list-style-type: none">1. Basic knowledge of thermodynamics.2. Elementary crystallography and crystal structure.3. Mechanical behavior of materials.
<i>Postrequisites:</i>	None
<i>Textbooks/other required materials:</i>	None Reference books: <ol style="list-style-type: none">1. Carter, C.B. and Norton, M.G. <i>Ceramic Materials Science and Engineering</i>, Springer.2. Barsoum, M. W. <i>Fundamentals of Ceramics</i>, CRC Press.
<i>Course objectives:</i>	<ol style="list-style-type: none">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.
<i>Topics covered:</i>	<ol style="list-style-type: none">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 learning outcomes:

- 1. Knowledge of bonding and 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 of processing ceramics, bulk, and coatings.
- 6. Applications of ceramic materials in structural, magnetic, 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

Student Outcomes Pre-Fall 2018
(ABET EC2000)

Student Outcomes Fall 2018 forward
(ABET EC2019)

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	1	2	3	4	5	6	7	8	9	10	11
3						2		3	2	2					2		2	1			3				

Prepared by: Susmita Bose

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