

King Fahd University of Petroleum & Minerals
MECHANICAL ENGINEERING DEPARTMENT
ME 479: Modern Materials

Catalogue Description: (3-0-3)

Structure, processing and applications of ceramics, plastics and composites. Electrical, thermal, magnetic, and optical properties of materials. High-temperature materials for gas turbine engines. Coating Materials and applications.

Status in Curriculum (Required or Elective): Elective (offered Fall or Spring)

Prerequisites: ME 216 Materials Science and Engineering

Co-requisites: None

Prerequisites by Topics:

Textbook: None.

References:

- 1) **Materials Science and Engineering: An Introduction**, William Callister, 9th Edition, John Wiley & Sons, Inc., 2014.
- 2) **The superalloys: fundamentals and applications**, Roger C. Reed, Cambridge University Press, 2006.
- 3) **Ceramic Materials Science and Engineering**, C. Barry Carter, M. Grant Norton, Second Edition, Springer Science, Business Media, New York, 2013.
- 4) **Mechanical Properties of Ceramics**, Joshua Pelleg, Springer, Switzerland, 2014.

Coordinator: Dr. Saheb Nouari, Associate Professor

Goals:

This course is intended to introduce modern materials such as ceramics, plastics, composites, and nano-materials, and their electrical, thermal, magnetic, and optical properties. Applications of modern materials such as high-temperature materials and coatings in gas turbines will be emphasized.

Course Outline (Lectures and Laboratory Experiments):

1. Ceramics: structure, properties, applications. (7 hours)
2. Plastics: structure, properties, applications. (6 hours)
3. Composites: structure, processing, applications, nanocomposites. (7 hours)
4. Electrical properties of materials. (4 hours)
5. Thermal properties of materials. (3 hours)
6. Magnetic properties of materials. (3 hours)
7. Optical properties of materials. (3 hours)
8. High-temperature materials for gas turbine engines. (6 hours)
9. Coatings and applications. (5 hours)

Design Activities/Projects:

Students will learn, through term projects, how to design appropriate materials for specific applications.

Computer Usage:

Students are strongly encouraged to use computers in writing and presenting term projects.

Assessment Tools:

- i- Mid-term Examinations
- ii- Homework Assignments
- iii- Term Project
- iv- Final Exam

Course Learning Outcomes:

- I- Students shall demonstrate a basic understanding of the structure of ceramics, plastics, composites, and nano-materials.
- II- Students shall demonstrate a basic understanding of the electrical, thermal, magnetic, and optical properties of materials.

- III- Students shall demonstrate the ability to understand the relationship between structure and properties of materials.
- IV- Students shall demonstrate a basic understanding of the characteristics and properties of high temperature materials and their applications.
- V- Students shall demonstrate the ability to understand basics of advanced coatings.
- VI- Students shall demonstrate the ability to understand basics of advanced processing techniques.
- VII- Students shall demonstrate the ability to design appropriate materials for specific applications

Course Learning Outcomes mapped to Student Outcomes:

Student Outcomes	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>	<i>k</i>
Course-to-Student outcome mapping					IV, V, VI		VII			I, II, III,	
Emphasis*					M		M			M	

* L:: Little/None M: Moderate S: Strong

Status of Continuous Improvement review of this Course:

Date reviewed: -----
Prepared by: Dr. Saheb Nouari

Reviewed by: Materials and Manufacturing Group
Date prepared: March 20, 2014