Mechanical Engineering Dept. Department

Syllabus
ME 479: Modern Materials (3-0-3)

Course Catalog Description:

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.

Course Pre-requisites:

- ME 216: Materials Science and Engg.
- ME 217: Materials Lab

Course Objectives:

1. To introduce modern materials such as ceramics, plastics, composites, and nanomaterials.
2. To introduce the propeties of modern materials such as their electrical, thermal, magnetic, and optical properties.
3. To introduce the applications of modern materials such as high-temperature materials and coatings in gas turbines.

Course Learning Outcomes:

CLO1. demonstrate a basic understanding of the structure of ceramics, plastics, composites, and nano-materials

CLO2. demonstrate a basic understanding of the electrical, thermal, magnetic, and optical properties of materials

CLO3. understand the relationship between structure, processing, properties, and applications of materials

CLO4. understand basics of advanced coatings

CLO5. understand basics of advanced processing techniques

CLO6. demonstrate the ability to design appropriate materials for specific applications

CLO7. demonstrate the ability to use modern materials in state of art applications and research

Learning Resources:

- 1) Materials Science and Engineering: An Introduction, William Callister, 9th Edition, John Wiley &Sons, Inc., 2015. 2) The superalloys: fundamentals and applications, Roger C. Reed, Cambridge University Press, 2006. 3) Mechanical Properties of Ceramics, Joshua Pelleg, Springer, Switzerland,

2014. 4) Ceramic Materials Science and Engineering, C. Barry Carter, M. Grant Norton, Second Edition, Springer Science, Business Media, New York, 2013.

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Term Project	13	15.0%
Final	15	35.0%
Midterm	7	35.0%
Homework	biweekly	5.0%
Quizzes	biweekly	10.0%

Lecture Weekly Schedule:

Week#	Topics
1	1. Ceramics: structure, properties, applications. (7 hours)
2	1. Ceramics: structure, properties, applications. (7 hours) (Continue)
3	1. Ceramics: structure, properties, applications. (7 hours) (Continue)
	2. Plastics: structure, properties, applications. (6 hours)
4	2. Plastics: structure, properties, applications. (6 hours) (Continue)
5	2. Plastics: structure, properties, applications. (6 hours) (Continue)
	3. Composites: structure, processing, applications, nanocomposites. (7 hours)
6	3. Composites: structure, processing, applications, nanocomposites. (7 hours) (Continue)
7	3. Composites: structure, processing, applications, nanocomposites. (7 hours) (Continue)
8	4. Electrical properties of materials. (4 hours)
9	4. Electrical properties of materials. (4 hours) (Continue)
	5. Thermal properties of materials. (3 hours)
10	5. Thermal properties of materials. (3 hours) (Continue)
	6. Magnetic properties of materials. (3 hours)
11	6. Magnetic properties of materials. (3 hours) (Continue)
	7. Optical properties of materials. (3 hours)
12	7. Optical properties of materials. (3 hours) (Continue)
	8. High-temperature materials for gas turbine engines. (6 hours)
13	8. High-temperature materials for gas turbine engines. (6 hours) (Continue)
14	8. High-temperature materials for gas turbine engines. (6 hours) (Continue)
	9. Coatings and applications. (5 hours)
15	9. Coatings and applications. (5 hours) (Continue)