



ChE 312: Materials Science and Engineering

3 credit hour, 3 contact hour lecture, 3 credit hour Eng.

Instructor

Instructor: Dr. Mohammed Azzam

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Textbooks & References

A. Textbook

	Textbook 1
Title	Materials Science and Engineering
Author(s)	W.D. Callister and D.G. Rethwisch
Publisher	John Wiley & Sons, Inc
Year	2011
Edition	8 th

B. References

- William Smith, "Foundations of Materials Science and Engineering," 2nd edition, John Wiley & Sons, Inc., 1993
- P. Gordon, "Principles of Phase Diagrams in Materials Systems," McGraw-Hill, New York, 1968.
- R.E. Hummel, "Understanding Materials Science," Springer-Verlag, New York, 1998.

Specific Course Information

A. Course Catalog:

Atomic structure and bonding. Crystal structures. Solidification, crystalline, imperfections and diffusion in solids, Mechanical properties of Metals. Thermal processing of metals. Phase diagrams and engineering alloys. Polymeric, ceramic and composite materials.

B. Prerequisites or co-requisites

CHEM 347 - Physical Chemistry 2

ChE 203 - Principles of Chemical Engineering

C. Required, Elective or Selected Elective

Required

Objectives and Outcomes*

1. To present basic fundamentals and terminologies of materials sciences and engineering. [1]
2. To study atomic structure and interatomic bonding. [1]
3. To study the structure of crystalline solids. [1]
4. To study imperfections in solids. [1]
5. To study diffusion process in metals. [1,2]
6. To study the mechanical properties of metals. [1,2]
7. Study phase diagrams and relate them to design and control of heat-treating procedures. [1,2,6]

* Number in brackets refer to the Program outcomes

8. To study structures, properties, applications & processing of ceramics. [1]
9. To study polymer structures. [1]
10. To study characteristics, applications and processing of polymers. [1,2]
11. To study composite materials. [1]
12. Communicate your work (i.e. homework) properly. [3]

Contribution of Course to Meeting the Professional Component

Relationship to Student Outcomes (%)

1	2	3	4	5	6	7
50	40	5	-	-	5	-

Relationship to Chemical Engineering Program Objectives

PEO1	PEO2	PEO3	PEO4	PEO5	PEO6
Y	Y	Y	-	-	-

Topics Covered

- Introduction to Materials Selection
- Classification of Materials
- Atomic Structure and Bonding
- Crystal Structures
- Solid Solutions
- Crystal Imperfections
- Diffusion
- Mechanical Properties of Metals
- Phase Diagrams
- Polymers
- Ceramics
- Composites

Evaluation

<u>Assessment Tool</u>	<u>Expected Due Date</u>	<u>Weight</u>
Homework & Quizzes	One week after homework problems are assigned	10%
First Exam	According to the schedule posted by the Department	25 %
Second Exam	According to the schedule posted by the Department	25 %
Final Exam	According to the schedule posted by the University for the finals' exams	40 %