



# Mechanical Engineering

## ME 3243 Materials Engineering

### Syllabus

Fall 2009

#### Required course in Mechanical Engineering

#### Part A- Course Outline

#### Catalog Description:

(3-0) 3 hour credit. (CHE 1103 and EGR 2213)

Fundamentals in structure, properties, and mechanical behavior of engineering materials (Formerly ME 2243. Credit cannot be earned for both ME 3243 and ME 2243.)

#### Prerequisites:

1. CHE 1103 – General Chemistry (Requires grade of C or higher)
2. EGR 2213 – Statics and Dynamics (Requires a grade of C or Higher)

#### Textbook(s) and/or required material:

- William D. Callister, Jr., Materials Science and Engineering, 7th Edition, John Wiley & Sons, Inc., 2007.
- **References:**
  1. D.R. Askeland and P.P. Phulé: The Science and Engineering of Materials, 4th Edition, Brooks/Cole. 2003.
  2. J.M. Shackelford, Introduction to Materials Science for Engineers, 5th Edition, Prentice-Hall, Inc. 2000.

#### Major Prerequisites by Topic:

1. General physics (forces, energy, and mechanics)
2. Calculus (vectors, differentiation, and integration)
3. General chemistry (periodic table, valences, atomic structures)
4. Statics (force equilibrium, internal forces)

#### Course objectives:

To provide an opportunity for students:

1. To understand the atomic and molecular structures of engineering materials,
2. To understand the mechanical behavior of engineering materials,
3. To learn the thermal processing of engineering materials,
4. To learn other physical properties of engineering materials,
5. To learn how engineering materials are fabricated and its effect on materials properties.

#### Topics covered:

1. Atomic and molecular structure of materials
2. Imperfections in materials
3. Diffusion
4. Mechanical properties of materials
5. Dislocations and strengthening mechanisms
6. Failure of engineering materials
7. Phase diagram
8. Phase transformation
9. Applications and processing of metals
10. Introduction to ceramics
11. Introduction to polymers
12. Introduction to composites
13. Other properties

:

150 minutes of lectures per week

**Contribution of course to meet the professional component:**

This course prepares students to work professionally in the areas of mechanical structures and systems.

**Relationship to ME Program Objectives and Outcomes:**

This course primarily contributes to Mechanical program outcomes that develop student abilities to:

- use the principles from chemistry, physics, statistics, and mathematics in engineering applications (Outcome A-1)
- identify, formulate, and solve engineering problems (Outcome A-3)

The course secondarily contributes to Mechanical program outcomes that develop student abilities to:

- understand and contribute to the challenges of a rapidly changing society (Outcome D-2)

**Evaluation Methods:**

1. Homework assignments
2. Midterm exams
3. Projects
4. Final exam (comprehensive)

**Performance Criteria:**

Objectives 1 through 5 will be evaluated using evaluation methods [1, 2, and 3]

**Course Content:**

Engineering Science: 3 credits (100%)

**Coordinator:**

Xiaodu Wang, Associate Professor of Mechanical Engineering

**Person(s) who prepared this description:**

Xiaodu Wang, January 12, 2007



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Signatures

## Part B- General Course Information and Policies

<b>Instructor</b>	Emilio Mendoza PhD
<b>Instructors' Office</b>	EB 3.04.26
<b>Instructor's Contact Information</b>	(210) 458-5526 E-mail: Emilio.mendozag@utsa.edu
<b>Instructors' Office Hours</b>	MW 2:00-4:00 pm or by appointment
<b>Meeting Time/Room – Section 1</b>	TR 3:30 pm - 4:45 pm EB 2.04.06

Class Conduct: Students are expected to assist in maintaining a classroom environment that is conducive to learning. To assure all students have an opportunity to gain from the time spent in class, students are prohibited from engaging in any form of distraction. Please consult the following web sites:

Disabilities: <http://www.utsa.edu/disability/students.htm> and Academic dishonesty: <http://www.utsa.edu/infoguide/appendices/b.html>

**Grader:** Jose Camero Jr

**Homework:** Homework will be assigned in every class, but will be collected only once a week on each Tuesday's class for all homework assigned in the last week. **No late homework will be accepted without exceptions.**

**Examinations:** There will be two examinations, three projects, and a final examination. The final examination will be comprehensive. The instructor will not provide makeup exams except for in advance approval.

**Grading:** The final grade will be determined based on the following areas and weights:

Two examinations (2 x 20%)	40%	
Homework		13%
Projects	12%	
Final Examination:	<u>35%</u>	
<b>Total</b> .....		<b>100%</b>

### Tentative schedule for classes and exams

Lecture	Date	Content	Lecture	Date	Content	
1	August 27	(Chapter 1) Introduction	16	20	(Chapter 10) Phase transformation	
2		(Chapter 2) Atomic structure & interatomic bonding	17	22	(Chapter 11) Thermal processing	
3		(Chapter 3) Crystalline structures	18	27	(Chapter 11) Metal alloys	
4	September 1	(Chapter 3-4) Crystalline structures & Imperfections	19	29	<b>2nd Exam (Tuesday)</b>	
5		3	(Chapter 4) Imperfections	20	November 3	(Chapter 12) Ceramic structure
6		8	(Chapter 5) Diffusion	21		5
7		10	(Chapter 6) Mechanical properties of metals	22	10	(Chapter 14) Polymer structure
8		15	(Chapter 6) Mechanical properties of metals	23	12	(Chapter 15) Polymer process
9		17	(Chapter 7) Dislocations & strengthening mechanisms	24	17	(Chapter 16) Composite materials
10		22	(Chapter 7) Dislocations & strengthening mechanisms	25	19	(Chapter 17) Corrosion
		24/29	<b>1st Exam (Thursday) TBD</b>	26	24	(Chapter 19) Thermal properties
11	October 1	(Chapter 8) Failure		26		
12		6	(Chapter 8) Failure		<b>December 3</b>	<b>Review</b>

<b>13</b>	8	(Chapter 9) Phase diagrams
<b>14</b>	13	(Chapter 9) Phase diagrams
<b>15</b>	15	(Chapter 10) Phase transformation

	<b>FINAL</b>	<i>See ASAP</i>
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