

Summer 2012

**Dept. of Manufacturing System Engineering and Management
MSE 227 – Materials Engineering**

Time: M.W 11:00-12:15 pm, Rm 3504
Instructor: Dr. B. Bavarian, Email: bavarian@csun.edu

Office: JD 3513, 818/677-3917, Office Hour: MW 10:30 –11:00AM
Website: http://www.csun.edu/~bavarian/mse_227.htm
Phone: (818) 677-3917

Textbook: William D. Callister Jr, and David G. Rethwisch
Fundamentals of Materials Science and Engineering: An Integrated Approach,
John Wiley & Sons, NY, 4th Edition, 2012.
<http://www.wiley.com/college/callister>

Prerequisites: CHEM 101, PHYS220A, PHYS220AL, **Corequisites:** MATH 150B.

Three hours of lectures per week, Design units: 0.25

Course Description: An introductory course in engineering materials including metals, ceramics, polymers, and composites. Study of atomic and crystalline structures of materials. Application of basic principles to the study of mechanical, physical, and chemical behavior of materials. Selection of materials in engineering applications based on materials properties and processing. Design project on materials properties, selection or application.

The learning objectives are: To understand the principles of engineering and science in applications of materials and design. To learn to find information in literature and other available sources. To learn to use information systems (computer, internet, and other available sources) in engineering practice.

Methods of Students evaluation: three class examinations and a final examination. Design problems and homework (weekly assignments), and a written report on the design project

Date	Topic	Homework
May 30	Introduction	
June 4	Atomic Structure	2.4, 2.11
June 6	Crystal Structure	3.3, 3.7
June 11	Miller Indices	3.54, 3.62, 3.65
June 13	Imperfections	5.12, 5.16
June 18	Diffusion	6.4, 6.7, 6.16
June 20	Mechanical Properties	7.8, 7.24, 7.29, 7.44
June 25	Exam #1	
June 27	Strengthening	8.12, 8.23, 8.28
July 2	Failures	9.5, 9.15, 9.37
July 9	Phase Diagram	10.12, 10.30, 10.32
July 11	Phase Diagram	10.35, 10.53, 10.66
July 16	Phase Transformation	11.9, 11.24
July 18	Exam#2	
July 23	Electrical Properties	12.3, 12.19

July 25	Electrical Properties	12.25, 12.32
July 30	Materials applications, metals	13.7, 13.9
Aug. 1	Materials applications, non-ferrous	13.17, 13.18
Aug 6	Materials applications, ceramic	14.3, 14.6
Aug 8	Materials applications polymers	14.4, 14.7
Aug 13	Composite	15.1, 15.6, 15.7
Aug 15	Corrosion	16.4, 16.5, 16.14
Aug 20	Final Exam	11-1pm

Three hours of lectures per week, Design units: 0.25

Prerequisites: Chem 101, Phys 220A, Phys 220AL

Corequisites: Math 150B

Course Description: An introductory course in engineering materials including metals, ceramics, polymers, and composites. Study of atomic and crystalline structures of materials. Application of basic principles to the study of mechanical, physical, and chemical behavior of materials. Selection of materials in engineering applications based on materials properties and processing.

Learning Objectives: To understand the principles of engineering and science in applications of materials and design. To learn to find information in literature and other available sources. To learn to use information systems (computer, internet, and other available sources) in engineering practice.

Methods of Student Evaluation: Three midterm examinations, one final examination, weekly homework assignments, class attendance and term paper.

Course Method and Expectations: The main techniques used in this course center on the application of scientific principles to real-life situations. Library research is necessary to fully understand and assimilate the concepts discussed in class lectures. Homework assignments are an essential part of learning.

Grading Policy: A through F with Plus/Minus Grading.

Homework	5 %
Term Paper	10 %
(2) Midterm Exams	40 %
Final Exam (2 hrs)	45 %

Exams will be based on lecture and text book material (example questions and assigned homework). All exams will be closed book, no notes, individual effort. Equations will be provided. No cell phones or other personal communication devices are permitted during exams.

Study Suggestions:

1. Read the relevant material in the book
2. Review and understand the examples given in the book.
3. Do the assigned homework.

4. Work additional problems if you are having difficulty with a particular concept.
5. Come to office hours.

MSE 227 Design Project:

Option 1: Materials Application

The purpose of this report is to analyze the behavior of specific materials for a specific use. It is expected that this report will build upon course material and is at a technical difficulty of someone with a working knowledge of MSE 227.

Option 2: Materials Selection Report

The purpose of this report is to analyze material requirements in a specific design and to compare the behavior of candidate materials. The report should include the basis for selection in terms of the design, the selection criteria, comparison between materials behavior, and specification of the material for purchase.

Guidelines for Term Paper

Basic Format to include 1-paragraph Abstract; Introduction/Background information; Material properties, Processing Techniques, Applications, Results; Discussion & Conclusions; list of references.

- **Single spaced with 1-inch margins.** Roughly 7-10 pages long; content more important than length.
- **Include figures and tables. All figures and tables MUST have appropriate captions.**
- **All references must be appropriately cited in the text and listed at the end of the paper.**
- You must use **at least 5 references from a variety of sources other than the Callister/Rethwisch text book** (reference books, journals, engineering magazines, internet).
- **Paper is due in August 15, 2012.**

Topics for the Term Paper

1. Aluminum foam or titanium foam
2. Graphene materials
3. MEMS
4. Thin film materials
5. Materials for new jet engines
6. Smart materials (shape memory alloys)
7. Biosensors
8. High temperature polymers
9. Optical coatings (AR, thermal reduction)
10. Polymer coatings for biosensors
11. Flexible fiber optics
12. Flexible (bendable) metallic glass
13. Titanium Intermetallic materials
14. Advanced fiber reinforced composite materials (no concrete/cement materials)

Engineering College Statement

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

- using their knowledge and skills for the enhancement of human welfare,
- being honest and impartial, and serving with fidelity the public, their employers and clients;
- striving to increase the competence and prestige of the engineering profession; and
- supporting the professional technical societies of their disciplines.

Engineers shall:

- hold paramount the safety, health and welfare of the public in the performance of their professional duties
- perform services only in the areas of their competence
- issue public statements only in an objective and truthful manner
- act in professional matters for each employer or client as faithful agents or trustees, and avoid conflicts of interest
- build their professional reputation on the merit of their services, and not compete unfairly with others
- act in such a manner as to uphold and enhance the honor, integrity and dignity of the profession
- continue their professional development throughout their careers and provide opportunities for the professional development of those engineers under their supervision

- 1. Class members are expected to submit original work except in joint projects in which the activities are cooperative and collaborative.**
- 2. Class members are expected to attend class except when circumstances are outside the member's control.**
- 3. Class members are responsible for material in the reading assignments, class presentations, discussions, and homework examples.**
- 4. Homework sets and project reports are due at the time requested**
- 5. Class members are expected to be cooperative with other class members and to collaborate when appropriate with colleagues.**
- 6. Class members are expected to participate in the oral presentations as required.**
- 7. Class members are expected to comply with University regulation governing intellectual property, origin of work, and honesty. Failure to maintain these standards will result in student disciplinary action and a grade of F in the course.**