SAN JOSE STATE UNIVERSITY
Department of Chemical and Materials Engineering

MatE187 Fall 2005
Composites W. Richard Chung

Course Syllabus

Course Description: Theory, application, and design with composite materials, emphasis on high performance resin-matrix fibrous composites, metal-matrix materials. Topics include materials, test techniques, environmental effects, design consideration, and application. (Lecture 3 hours, 3.0 units)

Objectives: This course is designed to provide you with working knowledge in design, development and selection of fiber-reinforced composite materials for engineering applications. Various types of commercially available polymeric resins and fibers will be discussed in class. The emphasis will be placed on the fundamental understanding of design considerations, constraints, nonlinear plate theory related to mechanics of materials, the interfacial bonding strength, failure behavior and manufacturing techniques of composite materials.

Prerequisites: CE 112, MatE 195, or instructor consent

Class Hours: Tuesdays and Thursdays, 1500 - 1615, E-232

Office Hours: Tuesdays: 0900-1200 & Wednesdays: 1400-1600, other times by appointment only.

Office Room: E-385E

Office Phone: (408) 924-3927 **E-mail address**: wrchung@email.sjsu.edu

Textbook: D. Hull and T.W, Clyne, An Introduction to Composite Materials. Cambridge University Press, ISBN: 0-521-38855-4

References: J.W.S.Hearle, High Performance Fibers, 2001, CRC Press/ Woodhead Publishing: Boca Raton, Florida. TA 418.9.F5.H53, ISBN: 1-85573-539-3

Bor Z. Jang, Advanced Polymer Composites: Principles and Applications, 1994, ASM International, Materials Park, Ohio, TA418.9.C6J35, ISBN 0-87170-491-9

P. K. Mallick, Fiber-Reinforced Composites: Materials, Manufacturing and Design, 1988, Marcel Dekker, New York, New York, TA418.9.C.6M28, ISBN: 0-8247-7796-4.

Sanjay K. Mazumdar, Composite Manufacturing: Materials, Product, and Process Engineering, 2001, CRC Press: Boca Raton, Florida. TA 418.9.C6. M34, ISBN: 0-8493-0585-3

John J. Morena, Advanced Composite Mold Making, 1992, Van Nostrand Reinhold: New York, New York.

Donald V. Rosato et al. Designing with Plastics and Composites: A Handboo, 1991. Van Nostrand Reinhold, New York, New York

A. Brent Strong, Fundamentals of Composites Manufacturing: Materials, Methods, and Applications, 1989, Society of Manufacturing Engineers: Dearborn, Michigan. ISBN: 0-87263-358-6

Gordon G. Wallace, Geoffrey M. Spinks, Leon A.P. Kane-Maguire, Peter R. Teasdale, Conductive Electroactive Polymers: Intelligent Materials Systems, 2002, CRC Press: Boca Raton, Florida. TA 418.9.S62. C648, ISBN: 1-58716-127-3

Grading Basis: There will be two midterms and one final examination. Examinations are comprehensive; including subjects from all assigned readings, lectures, and classroom demonstrations. Homework assignments and quizzes will consist of essay questions and problem solving cases. A term project report must be completed and submitted by November 22.

Homework and Quizzes…….15%
Two midterm exams (each 20%) ……..……40%
Term project with oral presentation……...15%
Final Examination……..30%
Total: 100%

For all graded work, course letter grades will be assigned according to the corresponding ranges of cumulative averages listed below.

A+ 97 -- 100	A 94 -- 96	A- 90 -- 93
B+ 87 -- 89	B 84 -- 86	B- 80 -- 83
C+ 77 -- 79	C 74 -- 76	C- 70 -- 73
D+ 67 -- 69	D 64 -- 66	D- 60 – 63
F below 60		

Add/Drop Policy: Students wanting to enroll in the class must sign the roster, provided space is available. Last day to drop this class without a "W" grade is ***September 6***.

Important Dates: Midterm examination date: **Sept. 29** and **Nov. 3**

Final exam date: **Monday**, **December 12**, **1445 – 1700**

Term project report submission date: **Nov. 22**

Term project report presentation date: **Nov. 29**

Course Website: http://www.engr.sjsu.edu/wrchung/courses.html#187

The instructor will provide lecture notes, resources and additional information on the course website (URL listed above). You may need to periodically visit the course website for reading assignments, homework problems and solutions, and new developments in composites.

Homework: Work the homework problems on one side of a paper only. You need to number all the pages if more than one page is submitted. On top of each page write down your name, the course number, the semester, and the submission date. List the problem numbers in the Dowling textbook and restate the statement of the problem including simple sketches, if applicable. You must show the working steps and circle the numeric solutions**.** Underline them and don't forget units! The instructor will pay attention to these requirements.

Note: A few points will be docked if you don't provide any formulas or working steps. It is imperative that you provide one or two sentences at the end of calculations to describe its physical meaning and your deposition. It will be a brief statement used to state the physical significance or implication of your answer.

No late assignments will be accepted, as the problem solutions will be posted immediately after the submission date.

Term Project: A **Term Project** must be completed. The term project is a reading assignment which will involve a literature search in composite materials with regard to a testing/device/system/application. You will start with finding an interesting topic, then collect published articles (at least three journal articles) in this area, read the collected articles, and write a short summary of your study. This written report must be supported by technical merit, impact on scientific world, innovative testing methods, etc. The instructor will provide a few topics/ examples in class at a later date to help you select an appropriate topic. Completed term project reports will be at least 8-10 pages in length, double spaced not including illustrations or appendices, and will follow the CME department thesis format (visit http://www.engr.sjsu.edu/cme/Acad.html and click on "CME thesis guidelines"). An electronic copy must be submitted to turnitin.com for Plagiarism check. The details will be discussed in class. An oral presentation on the term project will be conducted in class on November 29th.

An oral presentation based on your submitted term project is expected to last at least 10 minutes, followed by a 3-5-minute discussion period. The presentation should be technical and include view graphs or visual aids related to the chosen subject area. Ideally the presentations should be conducted using the PowerPoint format. The instructor will provide a portable notebook computer along with an LCD projector in class for presentation purpose. Transparencies, films, and/or VCR recordings (VHS) can be used, but may not replace spoken reporting. A guideline with tips of presentation requirements will be distributed in class at a later date.

Academic Dishonesty: Strict University policy on academic dishonesty will be enforced in this course.

Students who violate the policy will receive an F on the specific test or assignment and be reported to the University after the incident. (Refer to Academic Integrity Policy S04-12 in SJSU Catalog for Academic Dishonesty Policy.)

Cheating means getting unauthorized help on an assignment, quiz, or examination. (1) You must not receive from any other student or give to any other student any

information, answers, or help during an exam. (2) You must not use unauthorized sources for answers during an exam. You must not take notes or books to the exam when such aids are forbidden, and you must not refer to any book or notes while you are taking the exam unless the instructor indicates it is an "open book" exam. (3) You must not obtain exam questions illegally before an exam or tamper with an exam after it has been corrected.

Plagiarism means submitting work as your own that is someone else's. For example, copying material from a book or other source without acknowledging that the words or ideas are someone else's and not your own is plagiarism. If you copy an author's words exactly, treat the passage as a direct quotation and supply the appropriate citation. If you use someone else's ideas, even if you paraphrase the wording, appropriate credit should be given. You have committed plagiarism if you purchase a term paper or submit a paper as your own that you did not write.

Mat E 187 Course Activity Outline

Week	Starting Date	Reading: Chapter #
1	Aug. 25	Ch.1 Introduction to composite materials
2	Aug. 30	Ch.2 Fibers and matrices
3	Sept. 6	Ch.2 Fibers and matrices
4	Sept. 13	Ch. 3 Structure architecture
5	Sept.20	Ch. 4 Elastic deformation of continuous fibers
6	Sept. 27	Ch.5 Elastic deformation of laminates
7	Oct. 4	Ch.5 Elastic deformation of laminates
8	Oct.11	Ch.6 Stress and strains in short-fiber composites
9	Oct. 18	Ch.6 Stress and strains in short-fiber composites
10	Oct. 25	Ch.7 The interface region
11	Nov. 1	Ch. 8 Strength of composites
12	Nov. 8	Ch.8 Strength of composites
13	Nov. 15	Ch.9 Toughness of composites
14	Nov. 22	Ch.10 Thermal behavior of composites
15	Nov. 29	Ch.11 Composite manufacturing
16	Dec. 6	Ch.12 Applications
	Dec. 8	Review of the Course – Last day of instruction
	Final Examination:	**Monday**, **December 12**, **1445 – 1700**

MatE 187 Course Learning Objectives

Upon the completion of this course, the student will be able to:

1. Recognize some of the basic differences in mechanical, physical, and thermal properties of composite materials that distinguish them from other materials

2. Explain the fundamental construction of composite materials and distinguish various types of composite materials

3. Apply the basic principles of elastic and plastic behavior of composite materials to industrial applications.

4. Calculate materials properties depending on the structure configuration and reinforcement orientation

5. Describe the concept of deformation mechanisms with respect to continuous and short-fiber reinforcements and their application to product design, manufacturing method, and service reliability

6. Identify the principal uses for each and major types of reinforcement and describe their advantages and limitations

7. Discuss the roles played by the fiber and matrix in a composite and recognize the interface problem in bonding

8. List environmental factors affecting material performance in a service condition

9. Compare the different types of reinforcement forms and evaluate their relative merits

10. Provide sources of information for supplies and materials used in the composite industry

11. Identify the major manufacturing methods for composites and discuss the areas where the improvements in composite manufacturing can be improved

12. Discuss special design considerations for processing composite materials

13. List and explain the most common causes of damage for composite structures

14. Describe the principal methods for damage detection and damage prevention