

Oregon Institute of Technology
Certificate of Completion in Composite Engineering Technology

ENGR407D
Composite Materials & Processes II

COURSE OBJECTIVES

Composite Materials & Processes I covers the basics of polymer chemistry, physics and *Material* forms. In section II of this series, the emphasis is placed on *Composite Manufacturing Processes*, assembly techniques and quality assurance issues. Major topics of concern are as follows:

1. Tooling for Composites
2. Commercial Processes
3. Automated Material Placement
4. Liquid Molding
5. Adhesive Bonding & Integrally Co-cured Structures
6. Thermoplastic Composites Processing
7. Post-Processing & Assembly
8. Nondestructive Inspection and Repair
- 9.

In addition, the ENGR version of 407A places additional math based emphasis on advanced topics. It requires completion of all the ENGT material plus extra HW3, HW6, midterm and final ENGR specific questions. The HW will be graded as 30% ENGT and 70% ENGR & tests will be graded as 70% ENGT and 30% ENGR.

COURSE REQUIREMENTS

- Prerequisite: M&P1, must be Boeing, U.S. Person
- Required - An active e-mail account for receiving information via Message Courier, PowerPoint, Word, and Acrobat Reader software.

GRADING

- Homework – 100 points, see below
- Mid Term Exam – 100 points, take home open book
- Final Exam – 100 points, take home open book

A	B	C	D	F
300-270	269-240	239-210	209-180	<180

COURSE MATERIALS

1. Lectures/learning module material is compiled from the Campbell and Mazumdar texts, industry sources, and Boeing documents.
2. Primary Textbook
 - P.K. Mallick, “Fiber-Reinforced Composites: Materials, Manufacturing, and Design,” CRC Press; 2 edition, (2007):1-1201, (ISBN-10: 0849342058)Secondary Textbooks
 - F. C. Campbell, “Manufacturing Processes for Advanced Composites,” *Elsevier Science Ltd*, (2004): 1-448, (ISBN: 1856174158)
[\\nw\data\Composites-Data\Text, Calendar, Lab\Text - Campbell](#)
 - S. Mazumdar, “Composites Manufacturing: Materials, Product, and Process Engineering,” C Press; 1 edition: (2001) (ISBN-10: 0849305853)
3. Course material will be shared via the following methods:
 - **Boeing e-mail and Message Courier** – encrypted when material is proprietary

ADDITIONAL RESOURCES

- United States Patent and Trademark Office <http://www.uspto.gov/patft/index.html>
- Boeing Library Services: <http://library.web.boeing.com/>
- Product Standards Data System:
<https://psds.web.boeing.com/psds/servlet/Psds?action=DisplayMainMenu>
- Technology Exchange Forum:
<http://pe.ca.boeing.com/people/PETechnicalExcellence.asp>

HOMEWORK

There are six homework assignments. **Late homework will be docked 10% or more.** Up to 110 points worth of homework is allowed (i.e., an extra homework can be handed in for extra credit). Each homework activity is worth 16.7 points.

HW #	Due Date	Description
1		Take home problem 1
2		Take home problem 2
3		Take home problem 3 (contains Extra ENGR content)
4		Take home problem 4
5		Take home problem 5
6		Take home problem 6 (contains Extra ENGR content)
Extra		Take home problem 7 or 8

TESTS

Tests will be take-home. The midterm will cover material from the first half of the course and the final will cover material from the second half. The tests will be a combination of short answer, fill in the blank, multiple choice and short essay. Questions will be taken from lecture and reading material. They will be e-mailed out 2 weeks prior to the due date. Completed tests must be e-mailed by midnight on the due date. Be sure to retain a copy of all work.

COURSE OUTLINE

Week	Date	Material
1		Introduction, Course Overview, Tooling for Composites, & Design for Manufacturing Campbell: 4 – Cure Tooling (103-130)
2		Commercial Processes Campbell: 11 – Commercial Processes (399-438)
3		Automated Material Placement Campbell: Ch. 5 – Automated Material Placement (pp. 144-173)
4		Liquid Molding Campbell: Ch. 9 – Liquid Molding (pp. 303-356)
		<i>Midterm Exam & 1st three HW Due (Covers weeks 1-4) (contains Extra ENGR content)</i>
5		Adhesive Bonding, Honeycomb Core & Unitized Structure Campbell: Ch. 8. - Adhesive Bonding & Integrally Co-cured Structures (pp. 241-301)
6		Thermoplastic Processing Campbell : Ch. 10 – Thermoplastic Composites (pp. 357-397)
		<i>Watch Guest Videos</i>
7		Post Processing & Assembly Campbell: Ch. 12 – Assembly (pp. 439-470)
8		Nondestructive Inspection & Repair Campbell: Ch. 13 - Nondestructive Inspection and Repair (pp.471-512)
		<i>Final Exam (Covers weeks 6-10), all Homework Due (contains Extra ENGR content)</i>

*- HW due

Incomplete “I” Grade:

An “Incomplete” will only be given in extenuating circumstances at the discretion of the instructor for which official work conflicts, illness or emergency situation has precluded completion of a major course event prior to the end of the course. An “Incomplete” must be resolved between the instructor and student during the term immediately following the course or the instructor-designated alternate grade will result and will be permanent.

Primary ABET CRITERIA:

- a. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines.
- b. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.
- f. An ability to identify, analyze and solve technical problems
- k. A commitment to quality, timeliness, and continuous improvement.

Disability Support:

If you may need a course adaptation or academic accommodation because of a disability, please contact Disability Services as soon as possible at the OIT main campus in Klamath Falls, Oregon. Their number is (541) 885-1129. The director is Dr. Joan Loustalet and she will verify the need for accommodations and develop accommodation strategies. She will coordinate a plan with you and the Seattle OIT program office.