

Oregon Institute of Technology
Certificate of Completion in Composite Engineering Technology

ENGR407B
Applied Composites II

COURSE OBJECTIVES

Familiarization with Composite Materials Applications, with emphasis on design, requirements, loads, certification, testing, repairs, and examples.

Students will gain the practical ability to use material allowables to analyze and design structure, including: (a) basic tension/compression of notched and unnotched axial and bending members, (b) laminate and sandwich structure, (c) beam and plate stability, (d) bolted and bonded joints, and (e) skin/stringer panels. Emphasis is on; quantified material performance, comparison of composite material behavior to metals, basic analysis and sizing methods, and realistic applications.

In addition, the ENGR version of 407AB places additional math based emphasis on advanced topics. It requires completion of all the ENGT material plus extra HW4, HW7, midterm and final ENGR specific questions. The HW will be graded as 30% ENGT and 70% ENGR & tests will be graded as 30% ENGT and 70% ENGR.

COURSE REQUIREMENTS

- Prerequisite: Applied I, 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 Project – 100 points, take home open book

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

COURSE MATERIALS

1. Learning modules will be compiled from ASM text, industry sources, and Boeing documents.
1. Primary Textbook
 - D.B. Miracle and S.L. Donaldson, “ASM Handbook Volume 21: Composites,” ASM International, (2001):1-1201, (ISBN: 0-87170-703-9)
[\\nw\data\Composites-Data\Text, Calender, Lab\Text - ASM Handook Volume 21](#)

Optional Textbook

- P.K. Mallick, “Fiber-Reinforced Composites: Materials, Manufacturing, and Design,” CRC Press; 3rd edition, (2007):1-1201, (ISBN-10: 0849342058)
2. Miscellaneous videos will be shown highlighting specific topics.
 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 will be 7 homework assignments. **Late homework will be docked 10%**. 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 12 or 20 points.

Midterm Test

The midterm will be take-home. It will cover material from the first half of the course and the final will consist of a research project. The midterm 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. It 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. Instructions for the final project will be provided during week 3.

Final Project

Instead of a final, we will have a research activity. The final deliverable will include the following:

1. 20 page PowerPoint presentation.

COURSE OUTLINE

Wk	Day	HW	Reading	Material
1				Introductions & Application examples
2		1-15	360-365 803-837	Properties & Performance
3		2-15	308-320	Design and Analysis I
4		3-18	302-307 353-359	Design and Analysis II: Beam Bending (<i>contains Extra ENGR content</i>)
5		4-14	271-289	Design and Analysis III: Bolted joints, Bonded Joints, Stability, & Requirements
				<i>Midterm (Covers weeks 1-5)</i>
6		5-12	344-352	Allowables and Certification Testing
		6-12	199-206 207-229	<i>Watch Guest Videos</i>
7		7-18	949-963 241-245	Micromechanics, Macromechanics and Failure (<i>contains Extra ENGR content</i>)
8			252-258 334-343	FEA, Fracture, Free-Edge, Fatigue, and Repair
				<i>Final Presentation & ENGR Final, all Homework Due</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.