

Oregon Institute of Technology
Certificate of Completion in Composite Engineering Technology
ENGT407A

Applied Composites I

COURSE OBJECTIVES

Applied Composites I is the first in a series of two courses on topics in applied methods for advanced composite materials. Major topics of concern are as follows:

1. Applications and Experience
2. Properties and Performance
3. Engineering Mechanics, Analysis and Design
4. Failure Analysis
5. Product Reliability, Maintainability and Repair

COURSE REQUIREMENTS

- Prerequisite: None, 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 ASM text, industry sources, and Boeing documents.
2. 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)
3. Miscellaneous videos will be shown highlighting specific topics.
4. 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.

Item	Due date
1. Article review: read and provide a 2-page written summary or 5-page PowerPoint summary of a trade journal article or web site concerning a composite application of interest to you personally.	
2. Composite people in the news: research a composite industry expert (Rutan, Goldsworthy, etc.) and prepare a 2-page paper or 5-page PowerPoint summary covering his/her career.	
3. Composite patent review: read and provide a 2-page summary or 5-page PowerPoint summary of a composite patent.	
4 Problems: Respond to questions	
5. Problems: Respond to questions	
6. Aerospace Product Paper: research and provide a 2-page paper or 5-page PowerPoint summary of a composite aerospace application.	
Extra credit: Complete "Extra Credit Homework Set"	

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	Modules & Reading Material
		Module 1 Applications and Experience ASM21 pp. 1019 Introduction to Applications ASM21 pp. 1020-1028 Automotive Applications ASM21 pp. 1071-1077 Sports and Recreation Equipment Applications ASM21 pp. 1085-1090 Marine Applications ASM21 pp. 1091-1100 Civil Infrastructure Applications
		Module 2 Applications and Experience ASM21 pp. 1057-1066 Aircraft Applications ASM21 pp. 1033-1042 Space Applications ASM21 pp. 1050-1056 High Temperature Applications ASM21 pp. 1029-1032 Automotive Applications of Metal Matrix Composites ASM21 pp. 1043-1049 Aerospace Applications of Metal Matrix Composites ASM21 pp. 1067-1070 Applications of Carbon-Carbon Composites ASM21 pp. 1100-1109 Applications of Ceramic-Matrix Composites
		Module 3 Properties and Performance ASM21 pp. 803-837 Properties and Performance of Polymer-Matrix Composites
		Module 4 Properties and Performance ASM21 pp. 838-858 Properties of Metal-Matrix Composites ASM21 pp. 859-868 Properties and Performance of Ceramic-Matrix and Carbon-Carbon Composites
		<i>Mid Term</i>
		Module 5 Engineering Mechanics, Analysis and Design ASM21 pp. 360-365 Design Criteria ASM21 pp. 207-229 Macromechanics Analysis of Laminate Properties ASM21 pp. 271-289 Bolted and Bonded Joints ASM21 pp. 295-301 Damage Tolerance ASM21 pp. 308-320 Analysis of Sandwich Structures
		Module 6 Failure Analysis ASM21 pp. 949-950 Introduction to Failure Analysis ASM21 pp. 951-957 Failure Causes ASM21 pp. 958-963 Visual Analysis, Nondestructive Testign, and Destructive Testing ASM21 pp. 964-972 Microscopy
		<i>Watch Guest Videos</i>
		Module 7 Damage Tolerance resistance

		ASM21 pp. 871 Introduction to Product, Reliability, Maintainability, and Repair ASM21 pp. 871-884 Designing for Repair ASM21 pp. 986-892 Repair Engineering and Design Consideration ASM21 pp. 893-898 Repair Applications, Quality Control, and Inspection ASM21 pp. 899-905 Ship Structure Repairs
		Module 8 Product Reliability, Maintainability and Repair ASM21 pp. 914-921 Maintainability Issues ASM21 pp. 934-945 Product Reliability, In-service Experience, and Lessons Learned
		<i>Final Exam (Covers weeks 6-10), 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.