

Introduction to Composite Materials (MAE4315)

Fundamentals of Composites (AE5315/ ME5348)

(Fall Semester 2009)

Textbook: Engineering Mechanics of Composite Materials (by I.M. Daniel and O. Ishai)
Published by Oxford University Press, Inc. , 2nd, 2006

Instructor: Wen S. Chan, Professor
Department of Mechanical & Aerospace Engineering
Materials Science and Engineering Program

Grading System		Tentative Grading Scale	
• homework	100 points	Total point	500
• mid-term	175 points	A	420 or above
• final	175 points	B	350--420
• project report	50 points	C	300--350
		D	250--299
		F	249--below

The undergraduate students who take ME4315 will receive 20 points bonus. The cut-off scores for grades will be slightly lower but not higher depending on the class performance.

Office : Room 112, Nedderman Hall

Class Time: TR 2:00-3:20pm

Office Hours: TR 4:00-5:00pm

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Fundamentals of Composites

(Fall Semester 2009)

Course Contents

Chapter 1	Overview of Composite Materials Technology applications of composites; definition; advantages and disadvantages of using composites; challenge issues in composite structural design	(general)	1wk
Chapter 2	Basic Concepts and Characteristics classifications; common terminology; fiber and matrix materials and their basic properties; laminate coding; weight and volume fractions	(material)	1wk
Chapter 3	Elastic Behavior of Unidirectional Lamina stress/strain relationship for general anisotropic solid, special orthotropic solid and transversely isotropic solid; stiffness and compliance matrices; index notation; stress/strain transformation matrices; elastic constants transformation	(mechanics)	2wks
Chapter 4	Strength of Unidirectional Lamina failure and failure mechanism; lamina failure criteria	(material)	1½wks
Chapter 5	Elastic Behavior of Multidirectional Laminates lamina strain/displacement relationship; force and moment resultants; lamination theory; characteristics of A,B,& D matrices; lamina stress/strain;	(mechanics)	2wks
Chapter 6	Stress and Failure of Multidirectional Laminates Stress analysis of 1 st ply failure; progressive failure analysis; edge interlaminar stress; Delamination, interlaminar fracture toughness;	(both)	2½wks
Chapter 7	Hygrothermal Effects hygrothermal effects on mechanical behavior; coefficients of thermal & moisture expansion; failure prediction due to hygroscopic load	(both)	1½wks
Chapter 8	Short Fibrous Composites theories of stress transfer; modulus & strength; effects of matrix ductility; fatigue behavior	(both)	1½wks
Chapter 9	Analysis of Composite Beams Equivalent modulus; bending stiffness of the beam with various cross- sections. Beam Deflections	(mechanics)	1wk
		mid-term & solution	1wk
		final exam	1wk

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Course Description:

Fundamental mechanics concepts of fiber-reinforced composites; relationships between the properties of the constituents and those of the unit composite ply; lamina and laminate anisotropic behavior; structural characteristics of A, B, and D matrices; lamination theory; strength criteria; hygrothermal analysis; interlaminar stress analysis.

Goals/Objectives: The course is intended to provide students with a clear and thorough presentation of both the theory and application of the fundamental principles of composite materials that used in structural design.

Attendance Policy: Students are strongly recommended to attend each class.

Homework:

Late homework will receive a 20% penalty per class. Special permission for late submission can be granted based on case by case. No homework will be accepted after the solution is posted.

American With Disabilities Act

The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 93112 - The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide “**reasonable accommodation**” to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with **informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels**. If you require an accommodation based on disability, I would like to meet with you in the privacy of my office during the first week of the semester to make sure that you are properly accommodated.

Academic Dishonesty

It is the philosophy of the University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. all persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.

“Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.” (Regents’ Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22)