MEEG 4023 – Composite Materials: Analysis and Design
Spring 2011Course Syllabus

Instructor

Dr. Douglas Spearot
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Lecture

Monday / Wednesday / Friday: 1:30 – 2:20 pm MEEG 217

Office Hours

Monday / Wednesday / Friday: 2:30 to 3:30 pm MEEG 204F

Text

Required:
Mechanics of Composite Materials, Second Edition, A.K. Kaw, 2005.
Supplementary:
Fiber-Reinforced Composites: Materials, Manufacturing and Design, P.K. Mallick, 1993.

Prerequisite

MEEG3013 – Mechanics of Materials

Statement of Course Objectives

The objectives of this course are to provide the student with (i) an introduction to composite materials and technology, (ii) a fundamental understanding of macro and micromechanical analysis of fibrous composite laminates, (iii) an overview of the use of composites in design, including their behavior under various loading conditions and (iv) exposure to the various manufacturing processes currently used to fabricate composite materials.

Term paper

Each student will be expected to research and write a review of a specific topic or application that has significant relevance to composite materials. Graduate students will be required to make a presentation in addition to their written term paper. The project may be related to the students individual area of interest or employment. All term paper topics must be approved.

Grading

Homework assignments (6 – 8 assignments): 20%
Exams (3 total non-cumulative): 3 x 20% = 60%
Term paper: 20%

Contacting Professor Spearot

If you use another email address, it is your responsibility to set up your UARK account to forward incoming mail and to make sure that your UARK email is not full.

MEEG 4023 – Composite Materials: Analysis and Design
Spring 2011Course Schedule*

Week	Dates (M,W,F)	Sections	Topic(s)
Week #1	1/19, 1/21	1.1 – 1.2	Course overview and policies
			Different types of composites
Week #2	1/24, 1/26, 1/28	1.2 – 1.5	Polymer matrix composites
			Advanced composite materials
Week #3	1/31, 2/2, 2/4	2.1 – 2.2	Review of mechanics
			Review of matrix algebra
Week #4	2/7, 2/9, 2/11	2.3 – 2.4	Material symmetries
			Thin unidirectional lamina analysis
Week #5	2/14, 2/16, ~~2/18~~	2.4 – 2.5	Unidirectional lamina examples
			Thin angle lamina analysis
Week #6	2/21, 2/23, 2/25	2.5 – 2.7	Angle lamina examples
		3.1 – 3.2	Introduction of micromechanics
Week #7	~~2/28, 3/2~~, 3/4	3.2 – 3.3	Fiber and matrix volume fractions
			EXAM 1 (Chapters 1, 2)
Week #8	3/7, 3/9, 3/11	3.3	Derivation of lamina elastic moduli
			Halphin-Tsai equations for elastic moduli
Week #9	3/14, 3/16, 3/18	3.4	Method of elasticity for elastic moduli
			Strength of composite lamina
Week #10	~~3/21, 3/23, 3/25~~	none	**Spring Break**
			Spring Break
Week #11	3/28, 3/30, 4/1	4.1 – 4.3	Stresses and strains in laminates
			EXAM 2 (Chapter 3)
Week #12	4/4, ~~4/6~~, 4/8	4.3	Laminate stress analysis examples
		5.1 – 5.2	Special laminate geometries
Week #13	4/11, 4/13, 4/15	5.2 – 5.3	Special laminate examples
			Failure of unidirectional and angle lamina
Week #14	4/18, 4/20, ~~4/22~~	5.3 – 5.4	Failure criterion for laminates
			Design considerations for laminates
Week #15	4/25, 4/27, 4/29	5.4 + Mallick	Design examples / carpet plots
			Manufacturing fundamentals
Week #16	5/2, 5/4	Mallick	Manual fabrication techniques
			Large-yield fabrication techniques
Finals Week	5/9 (1-3 pm)		**EXAM 3 (Chapters 4, 5 and Mallick)**

Dr. Spearot out of town 2/18, 2/27 – 3/3, 4/5 – 4/7 and 4/22; class will be rescheduled if possible.

* Course schedule may change slightly over the course of the semester; changes will be communicated in class and/or electronically