CE 546 Structural Mechanics of Composite Materials (3)

2016 Fall Semester — **Tentative** Course Syllabus

Lecture	Wednesday	6:40p.m. to 9:20p.m.	OHE 136
Professor	Dr. A. M. Niazy, P.E.		
Email	Niazy@usc.edu		
Textbook • Required	**R. F. Gibson, "*Principles of Composite Materials Mechanics*," 4th Edition, CRC Press, Inc., 2016, ISBN-13: 978-1-4987-2069-4.**		
References	1. *A. K. Kaw, "Mechanics of Composite Materials," 2nd Edition, CRC Press, Inc., 2005. (Recommended)*		
	2. E. J. Barbero, "*Introduction to Composite Materials Design*," 2nd Edition, CRC Press, Inc., 2011, ISBN-13: 978-1-4200-7915-9.		
	3. R. M. Jones, *"Mechanics of Composite Materials,"* 2nd Edition, Taylor & Francis, Inc., 1999.		
	4. M. W. Hyer, *"Stress Analysis of Fiber-Reinforced Composite Materials,"* McGraw-Hill Inc., 1998.		
	5. Y. C. Fung, *"Foundation of Solid Mechanics,"* Prentice Hall, 1969.		
	6. Reddy, J. N., *"Theory and Analysis of Elastic Plates and Shells,"* CRC, 2nd edition, December 2006.		
	7. P.L. Gould, *"Analysis of Shells and Plates,"* Prentice Hall, 1999.		
	8. R. Szilard., *"Theory and Analysis of Plates,"* Prentice Hall, 1974.		
	9. S. Timoshenko and S. Woinowsky-Krieger, *"Theory of Plates and Shells,"* 2nd Ed., McGraw-Hill, 1959.		
Course Description	Structural mechanics and applications of composites are discussed: anisotropic materials; laminated composites; buckling and dynamics; strength and failure; inter-laminar stresses; de-lamination; design considerations.		
Course Objectives	To achieve fundamental understanding of the subject of structural mechanics of composite materials and applications in aerospace, civil, and mechanical engineering.		

Learning Objectives	▪ Introduction
	▪ Anisotropic Elasticity
	▪ Thin Plate Theory
	  ○ Kirchhoff Hypothesis
	  ○ Solutions
	▪ Classic Lamination Theory
	  ○ ABD matrix
	▪ Strength and Failure
	  ○ Maximum stress/Strain
	  ○ More criteria
	▪ Micromechanics of Composites
	  ○ Stiffness
	  ○ Strength
	▪ Laminate Design
	  ○ Stress Concentration
	  ○ Fracture
	  ○ Joints		

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Policies on:	
Exams	• Closed book. • Only one sheet of 8.5" x 11" paper (two pages) of formulae allowed. • Calculator. • Students **must turn in questions sheets** with their answer sheets at the end of each exam.
Homework	Homework problems, which are assigned weekly, are **due on** the following **Wednesday**, by **6:40 p.m. in Los Angeles**, CA, USA; **unless otherwise instructed**.
Late work	Not to be accepted.
Make-up work	**No make-up on any examinations.**
Incomplete work	Will be graded accordingly.
Extra credit	No extra Credit.
Final grade scheme is based on percentages of graded coursework	Homework **20 %** Midterm **20 %** Project **20 %** Final Exam **40 %** Total **100 %**

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Tentative Lectures and Class Calendar

Week	Wednesday	Topics	Textbook Reading Assignments	Assignment	Delivery
1	24-Aug	Introduction	Sections 1.1-1.4, 1.6, 1.7, Appendix A	HW 1	
2	31-Aug	Anisotropic Elasticity	Chapter 2 all, Appendix B, Appendix C	HW 2	
3	7-Sep	Isotropic Thin Plate Theory: Kirchhof Hypothesis		HW 3	HW1
4	14-Sep	Isotropic Thin Plate Theory: D.E. of Equilibrium & B.C.			HW2
5	21-Sep	Isotropic Thin Plate Theory: D.E. Solutions		HW 4	HW 3
6	28-Sep	Classic Lamination Theory: ABD Matrix	7.1, 7.2, 7.3, 7.4, 7.5	**Project**	HW 4
7	**5-Oct**	**Midterm Exam (90 minutes)**			
8	12-Oct	Classic Lamination Theory: Bending, Buckling, Vibration	7.9, 8.3.3	HW 5	
9	19-Oct	Strength and Failure: Introduction, Maximum stress/strain, Tsai-Hill Criteria	4.1, 4.2, 10.3.1-10.3.3	HW 6	HW 5
10	26-Oct	Strength and Failure: More failure criteria	4.2.1, 4.2.2, 4.2.3	HW 7	HW 6
11	2-Nov	Micromechanics of Composites: Stiffness & Strength	3.1, 3.2, 3.3, 4.3	HW 8	HW 7
12	9-Nov	Micromechanics of Composites: Strength	3.1, 3.2, 3.3, 4.3	HW 9	HW 8
13	16-Nov	Laminate Design: Fatigue, Stress Concentration	7.4, 7.8.1, 7.10		**Project**
14	**23-Nov**	**No Class ; Thanksgiving Recess**			
15	30-Nov	Laminate Design: Interlaminar Stressess, Fracture	7.7, 9.1, 9.2, 9.2.2		HW 9
16	**7-Dec**	**Final Exam (120 minutes)**			

STATEMENT ON ACADEMIC INTEGRITY

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own.

All students are expected to understand and abide by these principles. *SCampus,* the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A:

http://www.usc.edu/dept/publications/SCAMPUS/gov/

Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at:

http://www.usc.edu/student-affairs/SJACS/

The Viterbi Honor Council presents the following honor code:

Engineering enables and empowers our ambitions and is integral to our identities. In the Viterbi community, accountability is reflected in all our endeavors.

Engineering+ Integrity.

Engineering+ Responsibility.

Engineering+ Community.

Think good. Do better. Be great.

These are the pillars we stand upon as we address the challenges of society and enrich lives.

STATEMENT FOR STUDENTS WITH DISABILITIES

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible.

DSP Contact Information

Location: STU 301

Hours open: 8:30 a.m. until 5:00 p.m., Monday — Friday

Phone number: (213) 740-0776