

CE 546 Structural Mechanics of Composite Materials (3)

2019 Fall Semester — **Tentative** Course Syllabus

Lecture	Wednesday	6:40 p.m. to 9:20 p.m.	RTH 105
Professor	Dr. A. 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	<ol style="list-style-type: none"> 1. E. J. Barbero, "Introduction to Composite Materials Design," 3rd Edition, CRC Press, Inc., 2017, ISBN-13: 978-1-315-296487 (Recommended). 2. A. K. Kaw, "Mechanics of Composite Materials," 2nd Edition, CRC Press, Inc., 2005. (Recommended). 3. G. H. Staab, "Laminar Composites," 2nd Edition, Butterworth-Heinemann, Inc., 2015, ISBN-13: 978-0128024003. (Recommended). 4. M. W. Hyer, "Stress Analysis of Fiber-Reinforced Composite Materials," McGraw-Hill Inc., 1998. 5. R. M. Jones, "Mechanics of Composite Materials," 2nd Edition, Taylor & Francis, Inc., 1999. 6. J. N. Reddy, "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. Y. C. Fung, "Foundation of Solid Mechanics," Prentice Hall, 1969. 		
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	<ul style="list-style-type: none"> ▪ Introduction ▪ Anisotropic Elasticity ▪ Thin Plate Theory <ul style="list-style-type: none"> ○ Kirchhoff Hypothesis ○ Solutions ▪ Classic Lamination Theory <ul style="list-style-type: none"> ○ ABD matrix ▪ Strength and Failure <ul style="list-style-type: none"> ○ Maximum stress/Strain ○ More criteria: Tsai-Hill/Tsai-Wu Criteria ▪ Micromechanics of Composites <ul style="list-style-type: none"> ○ Stiffness ○ Strength ▪ Laminate Design <ul style="list-style-type: none"> ○ Fatigue ○ Stress Concentration ○ Inter-laminar Stresses ▪ Environmental Degradation 		

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Policies on:											
Exams	<ul style="list-style-type: none">• 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, usually 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	<table><tr><td>Homework</td><td>20 %</td></tr><tr><td>Midterm</td><td>20 %</td></tr><tr><td>Project</td><td>20 %</td></tr><tr><td>Final Exam</td><td>40 %</td></tr><tr><td>Total</td><td>100 %</td></tr></table>	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	28-Aug	Introduction	Sections 1.1-1.4, 1.6, 1.7, Appendix A	HW 1	
2	4-Sep	Anisotropic Elasticity	Chapter 2 all, Appendix B, Appendix C	HW 2	HW1
3	11-Sep	Isotropic Thin Plate Theory: Kirchhof Hypothesis		HW 3	HW2
4	18-Sep	Isotropic Thin Plate Theory: D.E. of Equilibrium & B.C.		HW 4	HW 3
5	25-Sep	Classic Lamination Theory: Introduction	7.1, 7.2, 7.3, 7.4, 7.5	Project	HW 4
6	2-Oct	Midterm Exam (90 minutes)			
7	9-Oct	Classic Lamination Theory: ABD Matrix			
8	16-Oct	Classic Lamination Theory: Bending, Buckling, Vibration	7.9, 8.3.3	HW 5	
9	23-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	30-Oct	Strength and Failure: More failure criteria	4.2.1, 4.2.2, 4.2.3	HW 7	HW 6
11	6-Nov	Micromechanics of Composites: Stiffness & Strength	3.1, 3.2, 3.3, 4.3	HW 8	HW 7
12	13-Nov	Micromechanics of Composites: Strength	3.1, 3.2, 3.3, 4.3	HW 9	HW 8
13	20-Nov	Laminate Design: Fatigue, Stress Concentration, Interlaminar Stresses	7.4, 7.8.1, 7.10, 7.7, 9.1, 9.2, 9.2.2		Project
14	27-Nov	No Class ; Thanksgiving Recess			
15	4-Dec	Environmental Degradation			HW 9
16	11-Dec	Final Exam (120 minutes)			

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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

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STATEMENT ON ACADEMIC CONDUCT AND SUPPORT SYSTEMS

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, “Behavior Violating University Standards” <https://policy.usc.edu/scampus-part-b/>. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

Support Systems:

Student Counseling Services (SCS) - (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. <https://engemannshc.usc.edu/counseling/>

National Suicide Prevention Lifeline - 1-800-273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. <http://www.suicidepreventionlifeline.org>

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 - 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. <https://engemannshc.usc.edu/rsvp/>

Sexual Assault Resource Center

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: <http://sarc.usc.edu/>

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class. <https://equity.usc.edu/>

Bias Assessment Response and Support

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. <https://studentaffairs.usc.edu/bias-assessment-response-support/>

The Office of Disability Services and Programs

Provides certification for students with disabilities and helps arrange relevant accommodations. <http://dsp.usc.edu>

Student Support and Advocacy – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. <https://studentaffairs.usc.edu/ssa/>

Diversity at USC

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. <https://diversity.usc.edu/>

USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible, <http://emergency.usc.edu>

USC Department of Public Safety – 213-740-4321 (UPC) and 323-442-1000 (HSC) for 24-hour emergency assistance or to report a crime.

Provides overall safety to USC community. <http://dps.usc.edu>