

ADVANCED STRUCTURAL COMPOSITES

EAS 6242 Class Numbers 26515–18

Academic Term: Fall 2021

Asynchronous Online

Lecture videos available at

<https://ufedge.video.ufl.edu/Mediasite/Catalog/catalogs/fall-2019-eas6242>

Instructor:

Prof. B.V. Sankar

sankar@ufl.edu

(352) 392-6749 (email preferred)

Office Hours: TBA

Teaching Assistant: None

Course Description

Micro- and macro-behavior of a lamina. Stress transfer of short fiber composites. Classical lamination theory, static analysis of laminated plates, free-edge effect, failure modes.

Prerequisite: EGM 3520.

Course Pre-Requisites / Co-Requisites

A basic course in mechanics of composite materials is preferred. The basics of anisotropic elasticity and composite materials will be reviewed at the beginning. ***If you have not taken a course in composite materials, but if you are still interested in the topics below, contact the instructor for further discussion.***

Course Objectives

The major goal is to teach advanced analysis methods for composite structures. Currently fiber-reinforced and particle reinforced composites are used in aerospace, automobile, marine and rail transport, electronic packaging, buildings, and bridges (civil infrastructure), sporting goods etc. Further, active materials such as piezoelectric materials, have potential for use in aerospace structures, and civil infrastructures such as bridges and buildings. This course will help engineers to design these structures based on sound mechanics principles.

Required Textbooks and Software: None

The instructor will post notes on most of the topics.

Recommended Materials

- ***Structural Analysis of Laminated Plates***, J.M. Whitney, Technomic Publishing Co.
- ***Mechanics of Laminated Composite Plates, Theory and Analysis***, J.N. Reddy, CRC Press
- ***Current periodicals, articles, conference proceedings, NASA reports*** etc.

Course Schedule

1. Introduction and review of basic principles
2. Analysis of laminated anisotropic plates:
 - 2a) Plate equations of motion
 - 2b) Energy formulation
 - 2c) Static analysis of laminated plates
 - 2d) Free vibration and dynamic analysis
 - 2e) Stability of laminated plates
 - 2f) Shear deformation
 - 2g) Large deflection of laminated plates

3. Sandwich construction
4. Advanced micro-mechanical methods for
 - (a) thermal properties
 - (b) mechanical properties
 - (c) strength prediction
5. Elements of fracture mechanics of composites
Analysis of delaminated plates including buckling
6. Advanced Topics
 - (a) Functionally Graded Materials & Structures
 - (b) Mechanics of layered plates containing active materials

Attendance Policy, Class Expectations, and Make-Up Policy

No late Homework will be accepted. Two lowest homework scores will be dropped. No make up quiz or exams will be given.

Excused absences must be consistent with university policies in the Graduate Catalog (<https://catalog.ufl.edu/graduate/regulations>) and require appropriate documentation. Additional information can be found here: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

Computer Some numerical work necessary; MATLAB or Excel should be sufficient.

Exams Open Notes (No books allowed)
Midterm exam WED 10/13/2021 (Time TBA)
Final Exam WED 12/15/2021, 3-5 pm

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (~10)	20 each	10%
Midterm Exam	100	40%
Final Exam	100	40%
Review Paper, Project	100	10%
TOTAL		100%

Grading Policy

93 – 100: A	87 – 89.9: B+	77 – 79.9: C+	67 – 69.9: D+	0 – 59.9: E
	83 – 86.9: B	73 – 76.9: C	63 – 66.9: D	
90 – 92.9: A-	80 – 82.9: B-	70 – 73.9: C-	60 – 63.9: D-	

More information on UF grading policy may be found at:
<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

Suggested schedule for watching the lecture videos

Lecture	Date	Day	Chapter	Topics (will be filled in Canvas)	HW/Quiz/Exam
1	23-Aug	MON			
2	25-Aug	WED			
3	27-Aug	FRI			
4	30-Aug	MON			
5	1-Sep	WED			
6	3-Sep	FRI			
-	6-Sep	MON		Labor Day	
7	8-Sep	WED			
8	10-Sep	FRI			
9	13-Sep	MON			
10	15-Sep	WED			
11	17-Sep	FRI			
12	20-Sep	MON			
13	22-Sep	WED			
14	24-Sep	FRI			
15	27-Sep	MON			
16	29-Sep	WED			
17	1-Oct	FRI			
18	4-Oct	MON			
19	6-Oct	WED			
-	8-Oct	FRI		Home Coming	
20	11-Oct	MON			
-	13-Oct	WED		Midterm Exam	
21	15-Oct	FRI			
22	18-Oct	MON			
23	20-Oct	WED			
24	22-Oct	FRI			
25	25-Oct	MON			
26	27-Oct	WED			
27	29-Oct	FRI			
28	1-Nov	MON			
29	3-Nov	WED			
30	5-Nov	FRI			
31	8-Nov	MON			
32	10-Nov	WED			
33	12-Nov	FRI			
34	15-Nov	MON			
35	17-Nov	WED			
36	19-Nov	FRI			
37	22-Nov	MON			

-	24-Nov	WED		Thanksgiving Eve	
-	26-Nov	FRI		Native American Heritage Day	
38	29-Nov	MON			
39	1-Dec	WED			
40	3-Dec	FRI			
41	6-Dec	MON			
42	8-Dec	WED		Last day of classes	
	15-Dec	WED		Final exam 3-5 PM	

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Conduct Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
<https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.
<https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.