

CONTINUUM MECHANICS

EGM 6611

Class Periods: MWF 5: 11:45-12:35 am
Location: EDGE
Academic Term: Spring 2021

Instructor:

Name: Youping Chen
Email Address: ypchen2@ufl.edu
Office Phone Number: 352-392-8494
Office Hours: MWF 5:10-6pm, Zoom

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

- None

Course Description

The course provides a broad introduction to the fundamentals of the mechanics of continuous media. It covers the concepts and general principles common to all branches of solids and fluid mechanics. Topics include kinematics, stresses, conservation equations, and constitutive theories. We will also introduce state of the art research on continuum mechanics.

Course Pre-Requisites / Co-Requisites

- Undergraduate Newtonian physics
- Sophomore mathematics and linear algebra

Course Objectives

Learn to formulate continuum mechanics problems, and to reduce vague questions and ideas into precise mathematical equations.

Materials and Supply Fees

- None

Required Textbooks and Software

- L.E. Malvern. Introduction to the Mechanics of a Continuous Medium. Prentice Hall, 1969.

Recommended Materials

- Will be posted in the course webpage

Course outline

- (1) Introduction to the course
- (2) Mathematical Preliminaries
 - a. Scalars, vectors, and tensors
 - b. Direct and indicial notations
 - c. Coordinate transformation
 - d. Tensor calculus
- (3) Motion and Deformation
 - a. Bodies, configurations, and motions
 - b. Deformation gradient, deformation tensors and strains
 - c. Principal strains
- (4) Stress
 - a. Stress vector and stress tensor

- b. Principal stresses and principal axes
- c. Stress measures and their rates
- (5) Basic Physical Principles
 - a. Conservation of mass
 - b. Balance of linear and angular momentum
 - c. Conservation of energy
 - d. Thermodynamics second law and the entropy inequality
- (6) Constitutive theories
 - a. General considerations and invariance requirements
 - b. Objectivity
 - c. Linear and non-linear elastic solids
- (7) Current Research on Continuum Mechanics

Course Schedule

Week		Topic
1	Jan 11	Introduction to the course/ Mathematical Preliminaries (Tensors)
2		
3		Chapter 1: Kinematics of Deformation
4		
5		
6		Chapter 2: Force and Stress
7		
8	Mar 1- 5	Midterm Exam
9		Chapter 3: General Principles
10		
11		
12		Chapter 4: Constitutive Theories
13		
14		
15		Current research on continuum mechanics
16	April 19-21	Review of the course/Final project due
17	April 30 (7:30–9:30am)	Final Exam

Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Attendance Policy, Class Expectations, and Make-Up Policy

Attendance is required. Students are responsible for knowledge of all scheduling and policy announcements made in class. Excused absences must be in compliance with university policies in the Graduate Catalog (<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#attendance>) and require appropriate documentation.

Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Homework Sets (4)	100 each	20%
Midterm Exam	100	30%
Final Exam	100	30%
Final Project	100	20%
		100%

Late homework will be deducted 20% per day. Solutions will be posted on the E-Learning class web site.

Grading Policy

Percent	Grade	Grade Points
90.0 - 100.0	A	4.00
87.0 - 89.9	A-	3.67
84.0 - 86.9	B+	3.33
81.0 - 83.9	B	3.00
78.0 - 80.9	B-	2.67
75.0 - 79.9	C+	2.33
72.0 - 74.9	C	2.00
69.0 - 71.9	C-	1.67
66.0 - 68.9	D+	1.33
63.0 - 65.9	D	1.00
60.0 - 62.9	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

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.ua.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.bluer.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

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 Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. 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
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.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

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: <http://www.counseling.ufl.edu/cwc>, 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://www.crc.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://care.dso.ufl.edu>.

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