

## **Bio-Solid Mechanics**

EGM 4592 Section MS24

**Class Periods:** Tuesday (Period 2-3; 8:30 am – 10:25 am) and Thursday (Period 2; 8:30 am – 9:20 am)

**Location:** Online Zoom (Zoom links of each class are available in Canvas)

**Academic Term:** Fall 2024

### **Instructor:**

Xin Tang

Email Address: [xin.tang@ufl.edu](mailto:xin.tang@ufl.edu)

Office Phone Number: 352-294-1194

Office Hours: Thursday 9:20 am -10:30 am, or other times by email appointment; on Zoom

### **Teaching Assistant/Peer Mentor/Supervised Teaching Student:**

Please contact through the Canvas website

NA

### **Course Description**

The 3-credit course builds on the key interdisciplinary elements of solid mechanics, fluid mechanics, and thermodynamics. The course explores coupled mechanical, thermal, electrical, and chemical energy transduction in living cells and tissues.

### **Course Pre-Requisites / Co-Requisites**

Elementary Differential Equations, Linear Algebra, or equivalent

### **Course Objectives**

The objective of the course is to foster the next generation of the world's leading engineers and scientists in the biomechanics fields. To accomplish this objective, the course will provide 3 elements: the systematic lectures covering the basis of bio-solid mechanics, the guest lectures covering the cutting-edge bio-solid mechanics research, and the detailed homework/exams to practice the knowledge introduced. Students will develop a deep understanding of the basic theory of bio-solid mechanics and mechanobiology including how coupled mechanical, thermal, electrical, and chemical activities function in living systems.

### **Materials and Supply Fees**

NA

### **Required Textbooks and Software**

- Title: A First Course in Continuum Mechanics
- Author: Yuan-Cheng Fung
- Publication date and edition: Pearson, 1994
- ISBN number: 0130615242, 9780130615244
- *Note:* Students are not required to purchase this book, because Dr. Tang will cover all the contents in class.

### **Recommended Materials**

- Title: Advanced Strength and Applied Elasticity
- Author: Ansel C. Ugural, et al.
- Publication date and edition: Prentice Hall, 2003
- ISBN number: 013137589X
- *Note:* Students are not required to purchase this book, because Dr. Tang will cover all the contents in class.

### **Required Computer**

UF student computing requirement: <https://news.it.ufl.edu/education/student-computing-requirements-for-uf/>

The course will require students to have either a Windows or a Mac to join the Zoom lecture.

### Course Schedule

Week 1:	Introduction of the course
Week 2:	Mathematics background
Week 3:	Basis of tensors and operations
Week 4:	Finite deformation; Exam 1 (9/12/24)
Week 5:	Homogeneous deformation
Week 6:	Stress and examples in biomechanics
Week 7:	Strain and examples in biomechanics
Week 8:	Inhomogeneous deformation; Exam 2 (10/10/24)
Week 9:	Conservation Law 1
Week 10:	Conservation Law 2
Week 11:	Thermodynamics 1
Week 12:	Thermodynamics 2; Exam 3 (11/7/24)
Week 13:	Bio-solid mechanics application in research 1
Week 14:	Bio-solid mechanics application in research 1
Week 15:	Final Exam (12/3/24)

### Important Dates

<9/12/24>	Exam 1 (8:30 am – 9:20 am, Zoom (the link is in Canvas))
<10/10/24>	Exam 2 (8:30 am – 9:20 am, Zoom (the link is in Canvas))
<11/7/24>	Exam 3 (8:30 am – 9:20 am, Zoom (the link is in Canvas))
<12/3/24>	Final Exam (8:30 am – 10:30 am, Zoom (the link is in Canvas))

### Attendance Policy, Class Expectations, and Make-Up Policy

This course emphasizes and encourages all students to have scientific discussions and idea exchange. Attendance (10% of the final score) is required for this course and will be monitored online. Please notify the instructor if you cannot attend the class and make sure to watch the recorded lectures. The instructors will consider extending the deadlines or providing alternative opportunities for the students who miss homework, quizzes, or exams. Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies:

<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

### Evaluation of Grades

Assignment	Total Points	Percentage of Final Grade
Attendance	100	10%
Homework Sets (5)	100 each	10%
Quizzes (10)	100 each	10%
Midterm Exam (3)	100 each	24%
Final Exam	100	30%
Review Paper	100	6%
		100%

### 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:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### ***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.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.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 Honor 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. 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 varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

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 Undergraduate Coordinator
- HWC OE Human Resources, 352-392-0904, [student-support-hr@eng.ufl.edu](mailto:student-support-hr@eng.ufl.edu)
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, [pld@ufl.edu](mailto:pld@ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto: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](mailto: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](mailto: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://elearning.ufl.edu/>.

**Career Connections 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**: <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.