Purpose: The overall purpose of this course is to introduce the fundamental principles of mechanics applied to the study of biological systems. BIOEN 4250 is required for all undergraduates in the Bioengineering Program and is the starting point for coursework in biomechanics. Students should be familiar with the concepts covered in this course before enrollment in Biomechanics II (BIOEN 6250), Biosolid Mechanics: Computational Biomechanics (BIOEN 7210) and Biofluid Mechanics (BIOEN 6220).

Objectives: Following completion of this course, students will be able to:
1. use both index and direct notation.
2. understand transformation of coordinate systems and how to solve problems in rigid body kinematics.
3. apply finite deformation kinematics to analyze deformation and strain.
4. understand the concept of stress.
5. apply linear elasticity to analyze stresses and strains in materials under homogeneous deformation.
6. derive and interpret the equations of motion for deformable bodies.
7. interpret differences in the material behavior of biological materials in terms of their constituents and organization.
8. perform analysis of viscoelastic systems based on discrete element models.

Prerequisites: Major status in the Biomedical Engineering program or instructor approval.

Lectures: T, Th 10:45 am – 12:05 pm; WEB 1230

Instructor: Lucas H. Timmins, Ph.D.
Office: MEB 2474
lucas.timmins@utah.edu

Office Hours: T, Th 1:00 – 2:00 pm, MEB 2474; other times by appointment

TA: Klevis Aliaj, klevis.aliaj@utah.edu
Jocelyn Todd, jocelyn.todd@utah.edu
Office Hours: Mondays 4-5:30pm, Wednesdays 9-10:30am, MEB 22475

Graders: TBD


Textbook: There is not an official textbook for BIOEN 4250. However, there are several texts that cover different parts of the material in this class. The following books are on 2-hour reserve at the Marriot Library, and optional reading assignments are listed next to most of the lectures in the syllabus: These textbooks include:

- *Continuum Mechanics*, A.J.M. Spencer, Dover Publications, Mineola, NY, 2004 (ISBN-13: 978-0486435947, call #QA808.2 .S63 2004). Although this is an optional textbook for the class, I **strongly recommend purchasing a copy of this optional textbook for yourself**. It is a good book and worth owning as a reference, and it will serve you well both for this class and for all subsequent classes in biomechanics. It can be purchased from Amazon for only $12.29 plus shipping.


Grading:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework (6 sets)</td>
<td>25% total</td>
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<tr>
<td>Exams (2)</td>
<td>50% total</td>
</tr>
<tr>
<td>Lab reports</td>
<td>25% total</td>
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</tbody>
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Homework: All homework will be submitted electronically through Canvas. Assignments are due at the beginning of lecture on the specified day, as listed in the Course Schedule. Please read the file “BIOEN 4250...” in Canvas for more information.
Instructions for Preparing Homework on Canvas for important instructions on preparing your homework. No late homework will be accepted without a medical note.

Laboratories: Labs are held four times during the semester and meet on T, W, Th, and F from 2:00 – 5:30 pm in MBE 2565. Please check the section you enrolled in to determine the appropriately day to attend lab.

Second Exam: The second exam will be held during Finals Week. The date and time is scheduled by the Office of the Registrar and therefore is not flexible (see http://registrar.utah.edu/academic-calendars/Final-Exams-F17.pdf). The final exam for BIOEN 4250 for this semester is scheduled for Monday, December 11, 2017, 10:30 am – 12:30 pm.

Absence Policy: Students are expected to attend all exams. Therefore, except for a University approved absence (Type I), which are explicitly listed in Policy 6-100.III.O (http://regulations.utah.edu/info/policyList.php), permission to be excused from an exam will only be granted for extremely unusual circumstances. All planned absences must be discussed in advance with the professor and supported by documentation. In the event of an unplanned absence (Type II), the reason for the absence must be communicated to the professor as soon as practically possible and documentary evidence is required (e.g., a doctor’s note in the case of illness). Failure to provide evidence for the absences will result in a zero for that exam, with no exceptions.

Regrades: Regrade requests must be submitted within one week after return of the work in question. Challenges to grades given on homework assignments or exams should be submitted in writing, and include the specific challenge and original work in question. Note that all regrade requests will result in complete regrading of the item in question, and thus could result in the grade decreasing, increasing, or staying the same.

University Policies: 

Academic Misconduct. The Department of Bioengineering has a zero-tolerance policy for any form of academic misconduct. Students are expected to abide by the University of Utah Code of Student Rights and Responsibilities (see http://regulations.utah.edu/academics/6-400.php). Academic misconduct, which includes cheating, misrepresenting one's work, inappropriately collaborating, plagiarizing, and fabrication of falsification of information, will not be tolerated. Any instances of academic misconduct will be immediately reported to the Department Chair, Associate Chair for Undergraduate Studies, and Dean of Students.

The Americans with Disabilities Act. The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

Addressing Sexual Misconduct. Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran’s status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).