

Instructor: Chao-Min Cheng
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Office Hour: By appointment
Lecture: T5T6T7

Prerequisites

None, unless your background is not in engineering. If this is the case, then please come talk to me first for “Instructor Permission”. In addition, a background in cell and molecular biology as well as mechanics will be helpful in this class (although not required).

Course Objectives

This course discusses how mechanical quantities and processes such as force, motion, and deformation influence body (and cell) behavior and function, with a focus on the connection between mechanics and biochemistry, in advance. Specific topics include: (1) large-scale biomechanics; (2) tissue-level biomechanics; (3) the role of stresses in the cytoskeleton dynamics as related to cell growth, spreading, motility, and adhesion; (4) the generation of force and motion by moot molecules; (5) protein and DNA deformation.

During this course we will introduce you to these subjects, train you to use them in real world applications, allow you to address a specific project, ask you to present and write about the project, and give you experience working as a team. This course will be a learning experience for you. We will have fun, but I demand a high level of application from my students in order to get the most out of it for everyone.

Textbook N/A; class notes/journal papers/magazine articles

Grade

Report (assignment) (3) 30%; **200 words (in English)**

Bench Work Report 25%

Final Report & Presentation 45%; **1000 words (in English)**

Tentative Schedule

Week 1-2 (2/16, 2/23): Introduction to biomechanics

Week 3-4 (3/1, 3/8): **Bench work I**

Week 5-6 (3/15, 3/22): Review on mechanics of materials **Report #1**

Week 7 (3/29): Why mechanics matters to biology and medicine?

Week 8-10 (4/12, 4/19, 4/26): Bone biomechanics (offered by Dr. Po-Liang Lai) **Report #2**

Week 11 (5/3): Mechanics versus biochemistry

Week 12 (5/10): Cell movement and deformation

Week 13 (5/17): Cytoskeleton dynamics (may include protein and DNA deformation)

Week 14 (5/24): Adjustment **Report #3**

Week 15 (5/31): **Bench work II**

Week 16 (6/7): **Final Presentation**