

**Instructor:** Chao-Min Cheng  
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**Office Hours:** By appointment  
**Lecture:** W5W6W7

**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

**Grades**

Report (assignment) (3) 30%; **200 words (in English)**  
Cell Culture and Immunostaining Report 30%  
Final Report & Presentation 40%; **1000 words (in English)**

**Tentative Schedule**

Week 1-2 (2/20, 2/27): Introduction to biomechanics  
Week 3-4 (3/6, 3/13): Large-scale biomechanics (cardiovascular system) **Report #1**  
Week 5-7 (3/20, 3/27, 4/10): Large-scale biomechanics (skeletal system); Dr. Po-Liang Lai at Chang Gung Memorial Hospital **Report #2**  
Week 8-9 (4/17, 4/24): Why mechanics matters to biology and medicine?  
Week 10 (5/1): Mechanics versus biochemistry  
Week 11 (5/8): Cell movement and deformation  
Week 12 (5/15): Cytoskeleton dynamics (may include protein and DNA deformation) **Report #3**  
Week 13-14 (5/22, 5/29): Cell culture and immunostaining (with T.A.)  
Week 15 (6/5): Final Presentation