

Instructor: Chao-Min Cheng
Office: 台達館 309
Telephone: X62402
E-mail: chaomin@mx.nthu.edu.tw
Office Hours: By appointment
Lecture: M5M6M7

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)**

Bench Work Report 25%

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

Tentative Schedule

Week 1-2 (3/2, 3/9): Introduction to biomechanics

Week 3-4 (3/16, 3/23): Review on mechanics of materials **Report #1**

Week 5 (3/30): Why mechanics matters to biology and medicine?

Week 6-7 (4/13, 4/20): **Bench work I**

Week 8-9 (4/27, 5/4): Bone biomechanics (offered by Dr. Po-Liang Lai) **Report #2**

Week 10 (5/11): Mechanics versus biochemistry

Week 11 (5/18): Cell movement and deformation

Week 12 (5/25): Cytoskeleton dynamics (may include protein and DNA deformation)

Week 13 (6/1): Adjustment **Report #3**

Week 14 (6/8): **Bench work II**

Week 15 (6/15): **Final Presentation**