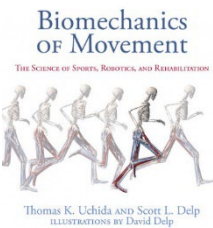


Image from <https://viterbivoices.usc.edu/rhea-2019/the-biomechanics-lab/>

## Engineering 323 Biomechanics Syllabus

Spring 2024

- Instructor:** Kurt DeGoede, Professor of Engineering and Physics
- 160E Esbenshade Hall
  - (717) 361-1380, anytime
  - [degoedek@etown.edu](mailto:degoedek@etown.edu), anytime
  - Cell: (717) 419-9568 (text)  
8:00 AM – 10:00 PM (no calls between 1:00 PM Saturday and 4:00 PM on Sunday please).
- Help Sessions:** Monday 12-1:30; Tuesday 9-10:30; Wednesday and Thursday 2:30 – 4:00  
Or by appointment. Please feel free to stop by my office anytime, if my door is closed, please leave a note.
- Class Hours:** **Tu Th** 11:00 – 12:20 in Esbenshade 164 - Most Lab sessions will be held in the HPL (Bowers)
- Prerequisites:** Junior Standing in Engineering, OT, pre-PT, PA or Exercise Science.
- Textbook:** **Either Print or E-Book is fine for use in the course**  
E-Book: <https://mitpress.ubliish.com/book/biomechanics-of-movement#purchase>  
Print ISBN Number: 978-0-262-04420-2  
Author: Uchida and Delp  
Title: Biomechanics of Movement  
Edition and Copyright: 1<sup>st</sup>, 2020  
Publisher: The MIT Press
- 
- Supplemental Materials:** There are numerous Biomechanics texts On Reserve at the High Library (HLRes), and others at my office (E161), or online (AccEGR). We will read selections from several of these over the semester.
- Hollinshead's Functional Anatomy of the Limbs and Back by Jenkins (E160E)
  - Muscles, Reflexes, and Locomotion by Tom McMahon (E160E)
  - Dynamic Modeling of Musculoskeletal Motion by Yamaguchi (HLRes)
  - Biomedical Engineering and Design Handbook ed Myer Kurtz (AccEGR [Link](#))
  - Occupational Biomechanics by Chaffin (HLRes)
  - Biomechanics and Motor Control of Human Movement by Winter (HLRes)

Revised **Catalog Description:** An introduction to the theory and practice of Biomechanics. Topics include functional anatomy and kinesiology; dynamics of muscle and tendon; models of muscle contraction; analysis of human movement: including gait, running, jumping, and lifting; computer simulations of human movement and exploration of experimental measurement techniques. \*Prerequisite(s): Junior Standing. Spring semester, even-numbered years.

### Course Objectives:

- 1 – Students will analyze human movement and performance (ABET1 and 4).
- 2 – Students will utilize Numerical Tools for Modeling human performance (ABET1).
- 3 – They will design parameters and strategy for optimized performance of musculoskeletal tasks (ABET2).
- 4 – Students will clearly articulate a review of a Biomechanics Topic of personal interest (ABET3 and 7).
- 5 – They will design an experiment to test hypotheses, collect, analyze, and interpret experimental data (ABET6).

### The Big Picture

As engineers we live out the Etown motto **Educate for Service** by creating environmental, social, and economic value for our society, our companies, and our communities. We are developing an **Etown Engineering Mindset**. This mindset frames our approach to engineering. We start with genuine curiosity to explore new ideas and become life-long learners. From our multidisciplinary framework we connect information from many sources to figure it out and solve novel problems.

In this course, we navigate across disciplinary bounds to apply engineering mechanics to biological systems. I expect students from any discipline to embrace a spirit of discovery and curiosity about areas of understanding they have less experience in. We will learn together: you will help each other, and I will support your learning at every step. Step out – take risks – know any failures along the way will help us learn and grow. Our applications will be directly tied to impact: you will learn clinical tools for assessing human movement and performance with direct applications to surgical decisions, rehabilitation, therapy, and performance optimization.



### Grading:

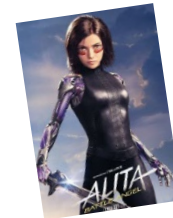
In this project heavy course, we do not have typical grading but rather Earn Points and Level Up. With this biomechanics course, we will work our way up to various fictional Cyborg Badges. Complete the work and earn the Badges.

Base scoring is out of 5 points:

- Outstanding (A)            5 points
- Good (B)                    4
- Fair (C)                     3
- Acceptable (D)            2

We will have

- 7 HW assignments (count 1x each)
- 1 Journal (2x)
- 3 Lab assignments (2x each)
- 1 Lit Review (2x)
- ~~1 Exam (2x)~~
- 1 IRB Proposal – work in pairs (2x)
- 1 Research Data Summary (1x)
- 1 Research Report – work in pairs (2x)
- 1 Project Presentation – work in pairs (1x)



For a total of 115 possible points

| Point Range | Cyborg Badge           |    |
|-------------|------------------------|----|
| 108 - 115   | Iron Man               | A  |
| 101 - 107   | Bionic Woman           | A- |
| 94 - 100    | Inspector Gadget       | B+ |
| 86 - 93     | Six Million Dollar Man | B  |
| 79 - 85     | Alita                  | B- |
| 72 - 78     | Emperor Zurg           | C+ |
| 64 - 71     | T-X                    | C  |
| 57 - 63     | Robocop                | C- |
| 50 - 56     | Borg Queen             | D+ |
| 42 - 49     | Frankenstein           | D  |
| 35 - 41     | Dyno Mutt              | D- |

Listed Due Dates are on the FRIDAY of the week indicated.

| Tuesday   | Thursday   |
|---|--|
| <b>16</b><br>Intro and Language of Motion (CH1) | Work Day: HW1; HW2 (Start if able); MATLAB.<br>HW1 Due |
| <b>23</b><br>Walking (CH2)                      | OpenSim Work Day<br>HW2 Due                            |
| <b>30</b><br>Running (CH3)<br>Lit Review        | Lab 1 - FP at HPL<br>HW3 Due                           |
| <b>Feb 6</b><br>Reading Biomechanics Research   | Work Day – (on your own)<br>Lab1 Due                   |
| <b>13</b><br>Muscle I (CH4)                     | Muscle II (CH5)<br>Lit Review Due                      |
| <b>20</b><br>Tug of War work day                | Writing an IRB<br>HW4* Due                             |



**Ethics:** Students are to act in accordance with the Pledge of Integrity:

I pledge to respect all members of the Elizabethtown College community and to act as a responsible member of the College community. I pledge to respect the free exchange of ideas both inside and outside the classroom. I pledge to represent as my work only that which is indeed my own, refraining from all forms of lying, plagiarizing, cheating, and academic dishonesty.

As members of the Elizabethtown College community, we hold each other responsible for maintaining these values.

and the NSPE code of ethics (Cannons attached, with Etown Engineering Professional Obligations)

Students will be asked to reaffirm their commitment to the pledge and the code with their signature on each exam. Dishonest practice can result in failure of the course and possible expulsion from the college.

All work should represent each student's individual efforts. **Students are encouraged to discuss assignments with other students and/or the instructor, however, submitted assignments should reflect the student's own work and understanding.** Any work obtained from any source should be properly referenced (indicate where you obtained a solution from an online source or a classmate and indicate your level of understanding of what you have submitted).

**This includes AI.** In this course, students shall give credit to AI tools whenever used, even if only to generate ideas rather than usable text or illustrations. When using AI tools on assignments, add an appendix showing (a) the entire exchange, highlighting the most relevant sections; (b) a description of precisely which AI tools were used (e.g. ChatGPT private subscription version or DALL-E free version), (c) an explanation of how the AI tools were used (e.g. to generate ideas, turns of phrase, elements of text, long stretches of text, lines of argument, pieces of evidence, maps of the conceptual territory, illustrations of key concepts, etc.); (d) an account of why AI tools were used (e.g. to save time, to surmount writer's block, to stimulate thinking, to handle mounting stress, to clarify prose, to translate text, to experiment for fun, etc.). Students shall not use AI tools during in-class examinations, or assignments unless explicitly permitted and instructed. Overall, AI tools should be used wisely and reflectively with an aim to deepen understanding of subject matter.

**Re-Grading:** Written requests, with full rationale, for re-grading of all coursework, will be accepted the next class period after original materials are returned to the students.

[Disabilities Statement](#)

[Religious Observance](#)

**Fine Print:** The preceding information represents the *intent* of the course and is subject to change at the discretion of the instructor.

**Elizabethtown Engineering Program Code of Ethics**

- I. Hold paramount the safety, health, and welfare of fellow students.**
- II. Perform project tasks and assignments only in the areas of their competence.**
- III. Submit assignments only in an objective and truthful manner.**
- IV. Act for team members, instructors, or employers as faithful agents or trustees.**
- V. Avoid deceptive acts.**
- VI. Conduct themselves responsibly, ethically, lawfully, and in line with the integrity, policy to enhance the honor, reputation, and usefulness of the profession and college's engineering department.**

**Professional Obligations (Etown Engineering Students)**

- 1. Engineering students shall be guided in all their relations by the highest standards of honesty and integrity.**
  - A. Be honest about your mistakes.
  - B. Do not cheat on exams or assignments.
  - C. Do not plagiarize or falsify data.
  - D. Do not aid or abet another student in unethical behavior.
- 2. Engineers shall at all times strive to gain the knowledge to serve the public's interest.**
  - A. Your goal in class should be to gain knowledge to justify your intended degree, not just to obtain a high grade.
  - B. Work for the advancement of society and the profession by engaging in the community, and recruiting youth to the engineering profession.
  - C. Inform professors of unethical requests from other students.
- 3. Engineers shall avoid all conduct or practice that deceives other students, instructors, or the public.**
  - A. In lab work, be truthful with ALL data, even if it is not favorable.
  - B. All assignments should be your own original work unless otherwise noted.
  - C. Do not finish and submit team projects without the approval of ALL your other team members.
- 4. Engineers shall not disclose confidential information concerning their own group work to any person outside of their group except for the professor.**
  - A. Do not put individual assignments in your public folder.
  - B. Do not spread the word of quiz questions or unannounced assignments to later sections of a course.
  - C. Engineering students who are or have been a TA shall not disclose information about tests and grades of other students.
  - D. Do not disclose or use information learned from the internships that have to do with processes or techniques of production.
- 5. Engineering students shall not be influenced in their scholastic duties by conflicting interests.**
  - A. Do not attempt to receive a favorable grade or recommendation by establishing an unprofessional relationship with a professor.
  - B. In peer assessments or as a TA, do not allow friendships or grades to sway judgment
  - C. Do not attempt to gain favor in class or for assignments through flattery of professors.

6. **Students should not attempt to gain advancement by downgrading other students' work or by other questionable methods.**
  - A. Credit should be awarded where it is deserved when submitting group work.
  - B. If another student does exceptional work, do not take credit for it if it is not your work.
  - C. If another student is performing inadequate work, calmly confront them about it before addressing it to the professor.
  - D. Students shall not sabotage the projects or advancements done by other students.
  - E. Do not blame group members for their own behavior.
  - F. Do not blame professors or staff for their grades.
7. **Engineering students should not attempt to injure the reputation of the engineering department or the reputation of professors and engineers in the department.**
  - A. If other engineering students are injuring the reputation of the department, you should inform the head of the department or the professor of their actions.
  - B. Every student in the department's actions should coincide with the integrity policy of the college to avoid degrading the department.
  - C. Students shall report malicious activities to the Head of the Engineering Department, or appropriate instructor. Yet, the student shall not tell others of the issue.
8. **Engineering students should accept personal responsibility for all of the work they do for the department and for their group.**
  - A. Students shall act truthfully when accused of misconduct.
  - B. Blame for violations of the integrity policy should not be placed on the department or professors, but rather on the individual who committed them.
  - C. Students should also accept the blame if their group submits unethical work because it is their responsibility to ensure any submission with their name on it is held to high ethical standards.
9. **Engineering students shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.**
  - A. Students shall not steal programs or work from other engineers or students from the internet through illegal networks.
  - B. Students shall properly cite information in all manners of presentation such as research papers, essays, PowerPoints, etc.

*Obligations written by Etown Engineering students Class of 2021  
Cannons adapted from: <https://www.nspe.org/resources/ethics/code-ethics>*