

ENGR 1166: Foundations of Engineering – BME Section

Credits and Contact Hours: 3 Credits (Two 75-minutes lectures per week)

Lectures: Tue & Thu: 8:00 AM – 9:15 AM	Sections 19/20	ENGR. II – room 322
11:00 AM – 12:15 PM	Sections 23/24	ENGR. II – room 321
2:00 PM – 3:15 PM	Sections 25/26	KNS – room 302

Note: Laboratory sessions will be held in BRONWELL, room 212 or 215, at regular class time.

Instructors: Kevin Brown, Ph.D.	(Sections 25/26)
Sabato Santaniello, Ph.D.	(Sections 23/24)
Yong-Jun Shin, Ph.D.	(Sections 19/20)

TAs: Mark McKenna (laboratory experiences); Xiu Zhai

Graders: Zev Kariganer; Kevin Smith; Kelly Stratton

Textbook:

Introduction to Biomedical Engineering, John D. Enderle & Joseph D. Bronzino (2012). ISBN: 978-012-374-979-6

Other Supplemental Materials:

Course handouts relevant to course topics covered.

Course Website:

Copies of the course syllabus, assignments, and handouts will be posted online at the HuskyCT class site. Students are responsible for announcements and assignments posted on the HuskyCT class site. Please check it regularly.

Specific Course Information:

a. Catalog Description:

The course provides an introduction to several areas of research found in Biomedical Engineering. Topics include basic biomechanics, bioinstrumentation systems, circuit elements and concepts, linear network analysis, bio-potentials, biosensors, various imaging techniques, fundamentals of bioinformatics and molecular engineering. A required class project will help students identify and formulate solutions to a problem found in the biomedical engineering field.

b. Prerequisite: None.

c. Required, Elective, or Selected Elective: Required.

Grading:

- Tests: 10%
- Assignments: 30%

- Exams: 50%
- Project: 10%

Topics Covered:

- Vectors
- Free Body Diagrams
- Forces, Equilibrium
- Biomechanical Modeling
- Biomechanical Testing Techniques
- Biomechanical Problem Solving Methodology
- Basic Bioinstrumentation System
- Basic Circuit Elements and Concepts
- Linear Network Analysis
- The Origin of Bio-potential Signals
- How Biosensors Record Signals in the Human Body
- Imaging Techniques
- Fundamentals of Bioinformatics
- Fundamental of Molecular Engineering

Course Objectives and Outcomes:

The objective of this course is to aid each student in making progress in the following areas:

- a. Learning to apply course material to improve thinking, problem solving, and decision making in analyzing Biomedical Engineering problems using proper assumptions and simplifications.
- b. Gaining knowledge about the mechanics, materials and operation of the human system.
- c. Learning fundamental principles and generalizations of engineering analysis used in Biomedical Engineering (e.g., Newton's laws, equilibrium of a body, basic circuit elements, biosensors, fundamentals of molecular engineering).

To this purpose, students will learn through lectures, assignments, and six hands-on laboratory sessions. At the end of this course, each student should be able to:

- 1) Apply knowledge of basic engineering to solve the problems at the interface of engineering and biology.
- 2) Identify, formulate, and solve engineering problems.
- 3) Use the techniques, skills, and modern engineering tools necessary for engineering practice.

Policies:

- a. Policy regarding Grading, Assignments, Class Participation, and Attendance:

Fifty percent (50%) of the final grade will be based upon the scheduled **closed-book closed-notes exams**. The content for exam will focus on class lecture and discussion, homework, and laboratory experiments. Inputs used in any calculation must be provided on the exam

copy to receive credit. Partial credit will be given for correct procedures even if an error is made early in the problem, and each step of the procedure will be graded. Hence, providing only the correct answer will be worth very little credit. **Students who will come in late for an exam will not be allowed any extra time.** Also, **makeup exams will be administered only in extreme cases** (e.g., medical emergency with physician signature).

Thirty percent (30%) of the final grade will be based upon the scheduled assignments, which include homework and laboratory reports. **Late assignments will not be accepted** unless an extreme condition occurs (e.g., medical emergency with physician signature).

Ten percent (10%) of the final grade will be based upon tests. Tests will include questions asked in class during lectures. Students will have to write their answers to these questions on handouts provided by the instructor and return them by the end of the lecture.

Ten percent (10%) of the final grade will be based upon presentation (written and oral) of an assigned design project. Projects will be evaluated based on these criteria:

- 1) Clarity in formulation and statement of the project goals;
- 2) Outcomes of the design process and relevance to the expected goals;
- 3) Clarity in formulation, statement, and motivation of quantitative assumptions;
- 4) Satisfaction of assigned design constraints (**Honor students only**);
- 5) Clarity of presentation of potential implementations of the design outcomes (**Honor students only**).

Participation in class includes answering questions (orally or written), participating in class discussions and demonstrations, and providing feedback. Students are responsible for reading assigned material **before** it is covered in class. Even if the content is not clear, the exposure will familiarize the students with the terminology and allow to focus on understanding the concepts discussed during class.

Students are responsible for all information and announcements covered in class. Students who are late or unable to attend class will have the responsibility to obtain missed information from other students.

b. Policy against Discrimination, Harassment and Inappropriate Romantic Relationships:

The University is committed to maintaining an environment free of discrimination or discriminatory harassment directed toward any person or group within its community – students, employees, or visitors. Academic and professional excellence can flourish only when each member of our community is assured an atmosphere of mutual respect. All members of the University community are responsible for the maintenance of an academic and work environment in which people are free to learn and work without fear of discrimination or discriminatory harassment. In addition, inappropriate Romantic relationships can undermine the University's mission when those in positions of authority abuse or appear to abuse their authority. To that end, and in accordance with federal and state law, the University prohibits discrimination and discriminatory harassment, as well as inappropriate Romantic relationships, and such behavior will be met with appropriate disciplinary action, up to and including dismissal from the University. More information is available at <http://policy.uconn.edu/?p=2884>

c. Sexual Assault Reporting Policy:

To protect the campus community, all non-confidential University employees (including faculty) are required to report assaults they witness or are told about to the Office of Diversity & Equity under the Sexual Assault Response Policy. The University takes all reports with the utmost seriousness. Please be aware that while the information you provide will remain private, it will not be confidential and will be shared with University officials who can help. More information is available at <http://sexualviolence.uconn.edu/>

Academic Honesty and Student Code:

Academic dishonesty of any type will not be tolerated in this class. Students should refer to the Student Code, section on Academic Integrity at http://www.dos.uconn.edu/student_code.html, for specific guidelines.

Students with Disabilities:

Students who need course adaptations or accommodations because of a disability are invited to notify the instructor as soon as possible. Students with disabilities who believe that they may need accommodations in this class are encouraged to contact the Disability Services Office (<http://www.csd.uconn.edu>) as soon as possible in order to ensure that such accommodations are implemented in a timely fashion.

Non-Discrimination Policy Statement:

The University of Connecticut does not discriminate on the basis of race, color, religion, national origin, ancestry, disability, genetic information, sex, sexual orientation, gender identity or expression, age, veteran status, marital status or other legally protected characteristics in all programs and activities and supports all state and federal laws that promote equal opportunity and prohibit discrimination, including the provision of reasonable accommodations for persons with disabilities. The University engages in an interactive process with each person making a request for accommodations and reviews the requests on an individualized, case-by-case basis. To request an accommodation or for questions related to the University's non-discrimination policies, please contact: Elizabeth Conklin, J.D. ADA Coordinator, Title IX Coordinator, Associate Vice President, Office of Diversity and Equity, 241 Glenbrook Road, Unit 4175, Storrs, CT 06269 Phone: (860) 486-2943 Email: ode@uconn.edu / Website: www.ode.uconn.edu

Schedule:

A tentative schedule is reported. Students must check their email for any change.

Week	Date	Subject
1	01/20-22	Introduction to Biomechanics
2	01/27-29	Center of Gravity / Laboratory 1
3	02/03-05	Free Body Diagrams / Segmental Analysis
4	02/10-12	Laboratory 2 / Exam 1
5	02/17-19	Introduction to Bioelectricity
6	02/24-26	Circuit Analysis
7	03/03-05	Laboratory 3-4
8	03/10-12	Discussion / Exam 2
9	03/17-19	Spring break
10	03/24-26	Biopotentials
11	03/31 and 04/02	Biopotentials / Bioinstrumentation
12	04/07-09	Laboratory 5-6
13	04/14-16	Bioimaging
14	04/21-23	Bioinformatics
15	04/28-30	Exam 3 / Project Presentations