



BIOMEDICAL ENGINEERING

Carnegie Mellon

42-201: Professional Issues in
Biomedical Engineering
Spring 2015

Class Time: Thursdays, 12:30 to 1:20 PM
Classroom: DH A302

Instructor: Yu-li Wang, Ph.D., Professor and Head of Biomedical Engineering
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Teaching Assistant: Khoi Nguyen
TA E-mail: khoinguy@andrew.cmu.edu

Textbook: No textbook is required for this course, which relies heavily on self-study of online materials. Suggested launching point for online research may be provided in the assignments.

Class Website: All registered students will have access to the class website via Blackboard (<http://www.cmu.edu/blackboard>). Class announcements, documents, online discussion, assignments, and grades are posted on this website.

Prerequisite or Co-requisites: 42-101 Introduction to Biomedical Engineering

Course Description: This course exposes students to many of the issues that biomedical engineers face. Topics covered include bioethics, regulatory issues, current research, and career paths. Outside speakers, case studies and student presentations will cover various real world problems and issues, and progress toward their solution.

With the ready access to a vast amount of online information, the course expects students to build the skills and habit of collecting and filtering information efficiently and proactively, as a key component for lifelong active learning. The course also encourages students to interact with each other through presentations, discussions in class or online, and collaborations, to replace the outdated educational approach of passive learning through instructor lecturing.

Course Objectives:

By the end of this course, the students should be able to describe the following topics and apply them to real-life situations:

1. Biomedical Engineering Ethics
2. Use of Animals in Biomedical Research
3. Use of Humans in Biomedical Research
4. Regulatory Issues
5. Careers in Biomedical Engineering
6. Purpose and Benefits of Advanced Education
7. Current Research in Biomedical Engineering

8. Entrepreneurship in Biomedical Engineering
9. Job Hunting in Biomedical Engineering
10. Habits and Strategies for lifelong active learning

Relation of Class to ABET Criteria

<i>ABET Criteria</i>	<i>Relation of Class to Criteria</i>	<i>Mechanism</i>
Ability to apply knowledge of mathematics, science, and engineering	Secondary	Lectures Presentations and discussions Pre- and post-class assignments
Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	Secondary	Lectures Presentations and discussions Pre- and post-class assignments
Ability to function on multidisciplinary teams	Secondary	Pre- and post-class assignments
Ability to identify, formulate, and solve engineering problems	Secondary	Lectures Presentations and discussions Pre- and post-class assignments
Understanding of professional and ethical responsibility	Primary	Lectures Presentations and discussions Pre- and post-class assignments
Ability to communicate effectively	Secondary	Presentations and discussions Pre- and post-class assignments
Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	Primary	Lectures Presentations and discussions Pre- and post-class assignments
Recognition of the need for, and an ability to engage in life-long learning	Primary	Pre- and post-class assignments
Knowledge of contemporary issues	Primary	Lectures Presentations and discussions Pre- and post-class assignments
Understanding of biology and physiology	Secondary	Lectures Presentations and discussions Pre- and post-class assignments
Capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve the problems at the interface of engineering and biology	Secondary	Lectures Presentations and discussions Pre- and post-class assignments
Ability to address problems associated with the interaction between living and non-living materials and systems	Secondary	Lectures Presentations and discussions Pre- and post-class assignments

Class Format: Most classes start with a lecture or presentation, possibly followed by a 15 minute student presentation and discussion about the homework done during the previous week. Each class will be associated with an assignment to be completed either before or after the class, where students engage in self-study to prepare for the class or build up from what they learned in the class. Students selected for presentation will be informed no later than 24 hours before the class.

Except for online training modules designed for single students, the assignments may involve teamwork of up to four students. Students are encouraged to seek teammates majoring in different traditional engineering disciplines. Different teams may be formed for different assignments.

Contact of the Instructor: The instructor is prepared to respond to student questions including class materials or regulations. Students should first send an email to the instructor with a subject line starting with 42-201. A meeting will be set up if the question cannot be answered completely by email. Questions related to homework grades may be sent to the TA.

Homework Assignments: There will be a homework assignment for each class, to be submitted through the Blackboard. There are two types of homework.

The first type is online training modules, which may consist of reading materials and quiz questions. Students are required to submit a certificate showing successful completion of the module.

The second is self-study conducted either before or after a class. A short reading or web site will be suggested as the launching point. After completing the reading, the student is required to search for additional information using key terms identified in the starting reading. Each homework is expected to take around 2 hours although extra effort is always possible and encouraged. Submitted homework should contain the following components:

1. Title: assignment date, topic, and student name (or names if Part 2 and 3 below involves a team)
2. Main body:
 - Part 1: outline what was learned at the previous class, which may be in any format including bullet points but must reflect that students have paid attention to the class.
 - Part 2: outline what was learned from the self-study, which may be in any format including bullet points. Indicate the source such as the URL
 - Part 3: A 2-3 sentence summary of Part 2. It will also be used when deciding if the report should be considered for presentation
3. Homework should be submitted as pdf or doc(x) files.

Submission of Homework Assignments and Late Submission Policy: Assignments should be submitted electronically via Blackboard, due the following Sunday or Monday midnight, as specified in each assignment. There will be 8 hours of grace period, after which 0.2 points will be taken away from the grade for every 12 hours of delay.

Tips for the Presentation:

- Unless otherwise specified, plan on a presentation of around 8-10 minutes.

- Budget the time and control the pace. A 10 minute talk can be much more difficult than a 30 minute talk, since every minute must be planned carefully.
- Use PowerPoint effectively to help both the audience to understand and yourself to remember what to say. Do not read the slide aloud. Do an online research on PowerPoint tips.
- Make it interesting and stimulating, draw less than obvious connections and conclusions, try piecing stories together to form a big picture. Avoid laundry list. Define a theme.
- Both the content and time control will be considered for the grade.

Online Discussion: Peer interaction is an important component of this class. While students are encouraged to express their thoughts and raise questions during the class, those feeling uncomfortable to do so are expected to engage in online discussion after the class. A Discussion Forum will be set up following each class after 1/22. While the instructor and TA may provide some initial threads, students are encouraged to initiate new threads based on what they learned and to respond as many times as they wish. Students are expected to show respectful behavior even when they hold different opinions.

Grading:

Attendance	Starting the second class, 4 points will be earned for each class attended
Assignments	Each assignment earns between 0 and 4 points
Participations	Points may be earned for the presentation and contributions to the discussion. Up to 2 points may be earned for each selected presentation. 0.1 to 0.4 points may be earned for each nontrivial question/comment during the class or online, up to 2 points for each class. Students who contributed to the discussion should identify him/herself to the TA immediately after the class.

The following scale will be used to assign a final letter grade:

90 to 100%	A
80 to 89%	B
70 to 79%	C
60 to 69%	D
0 to 59%	R

Definition of 100%:

#classes x 4 points per class +
 #assignments x 4 points per assignment +
 sum of participation points for the entire class/#students/class score for the participation

Classroom Policies

Attendance: Attendance of each class is *mandatory*. Those with a compelling reason to miss a class must contact the instructor by email *before* the class. Students who miss a class are responsible for catching up with the materials and turn in the homework without delay.

Class Decorum: The following guidelines are established for maintaining an environment that is safe and conducive for learning.

- Lectures will start and end on time. Student arriving late or leaving early are asked to minimize any disruptions to the class.
- **The use of cell phones (including texting!) and laptops during class is prohibited. Class notes must be taken in hand writing.**
- Classroom activities may be recorded by a student for the personal, educational use of that student or for all students presently enrolled in the class only, and may not be further copied, distributed, published or otherwise used for any other purpose without the express written consent of the instructor. All students are advised that classroom activities may be taped by other students for this purpose.

Accommodation of Disabilities: Students who wish to request an accommodation due to a documented disability should inform the instructor and contact Disability Resources (102 Whitfield Hall, 8-2013, lpowell@andrew.cmu.edu) as soon as possible. A one-week notice is required for classroom accommodations.

Expectations of Students and Instructors:

The instructor expects the following of students:

1. To arrive at class on time
2. To turn in assignments in time (see policy on assignment submission)
3. To inform immediately the instructor if extenuating circumstances prevent the student from attending a class or arriving in time
4. To follow the code of conduct regarding academic integrity
5. To seek assistance as necessary
6. To respond within 24 hours during the week and 48 hours on weekends if contacted by the instructor or grader

The students may expect the following of the instructor:

1. To provide a comprehensive syllabus that describes class description, procedures, and policies
2. To start and end the class sessions on time
3. To inform students in time of any changes to the course schedule or assignments
4. To make himself available to help the student with questions
5. To return the homework within two weeks after the due date
6. To respond to student contact within 48 hours

These expectations were adapted from those developed by Howard Culbertson at Southern

Nazarene University. The original list of expectations can be accessed at <http://home.snu.edu/~HCULBERT/contract.htm>.

Course Schedule

Class	Date	Topic	Lecturer	HW Due
1	01/15/15	BME Undergraduate Programs	Yu-li Wang	No
2	01/22/15	Responsible Conduct of Research	Students	Yes
3	01/29/15	Use of Animals in Biomedical Research	Keith Cook	Yes
4	02/05/15	Human Subjects in Biomedical Research	Conrad Zapanta	Yes
5	02/12/15	Government (FDA) Regulations	Conrad Zapanta	Yes
	02/19/15	No Class		No
6	02/26/15	Entrepreneurship in Biomedical Engineering I	Kelly Collier B.S. BME/MSE '11	Yes
7	03/05/15	Life as a Graduate Student	Grad Students	Yes
	03/12/15	No Class -- Spring Break		No
8	03/19/15	Current Biomed Eng Research I	Students	Yes
9	03/26/15	Career Options for a Ph.D. Engineer	Keith Cook	Yes
10	04/02/15	Entrepreneurship in Biomedical Engineering II	Mary Beth Wilson B.S. BME/MSE '07 Ph.D. BME '13	Yes
11	04/09/15	Working in Large Corporations	Chelsea March, Ph.D. B.S. BME/ChE '09	Yes
	04/16/15	No Class -- Carnival		No
12	04/23/15	Current Biomed Eng Research II	Adam Feinberg Steve Chase	Yes
13	04/30/15	Job Hunting & Social Networking	Career Center	Yes