

## INTRODUCTION TO BIOMEDICAL ENGINEERING (BSEN 317)

Tues/Thurs 9:30 – 10:45 am

Fall 2021

L.W. Chase Hall, Room 112

**Instructor:** Dr. Nicole Iverson, Ph.D.  
260 Morrison Life Sciences Research Center  
iverson@unl.edu  
Office hours: Th 1 – 4 pm in 251 Chase Hall

**Teaching Assistants:** Kelly Broad [kbroad2@huskers.unl.edu](mailto:kbroad2@huskers.unl.edu)  
Office hours: T 3:30 – 5:30 pm in Adele Learning Commons, Study Room 119

**Textbook:** None required. You will read portions of The Immortal Life of Henrietta Lacks and The Invisible Gorilla, it is provided as a digital book by the UNL library and pdf files for this class. Information will be given in notes, handouts, etc.

**Assignments:** Assignments must be submitted electronically on Canvas prior to class on the due date (specific instructions for submission will be included in each assignment). Each student will be allowed 1 late assignment, meaning that it can be turned in up to 48 hours after it is due and will still receive credit. Students that do not utilize their late assignment option will receive extra credit in their overall Assignments grade at the end of the semester. All other late assignments will receive a score of 0.

**Class Participation:** You will be graded on your participation in class through physical presence and comprehension checks. Participation grades will be determined such that 1 missed class/comprehension check will not decrease the grade below 100%.

**Final Project:** You will prepare a product/technology evaluation and present the contents via a taped oral presentation that your classmates will watch. The evaluation will discuss an interesting biomedical based topic focusing on a device or technique.

|                        |               |     |              |
|------------------------|---------------|-----|--------------|
| <b><u>Grading:</u></b> | Assignments   | 40% | A+/A/A- ≥ 90 |
|                        | Participation | 30% | B+/B/B- ≥ 80 |
|                        | Final project | 30% | C+/C/C- ≥ 70 |
|                        |               |     | D+/D/D- ≥ 60 |

### **Course Objectives:**

At the end of this course, students will be able to:

- Describe a range of opportunities for biomedical engineers to make an impact in the world.
- Articulate the breadth of the biomedical engineering discipline and the variety of technical components involved in the discipline.
- Explain the most prevalent research areas and industrial applications in biomedical engineering.
- Identify the types of skills and analytical background required to successfully solve problems in the biomedical engineering fields.
- Compare the engineering aspects of medical technologies that have a similar function/end goal.
- Describe how different scientific concepts can be used to understand how the body functions.
- Communicate technical information about biomedical concepts, products, and technologies in both written and oral formats. (ABET 3)
- Recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts. (ABET 4)

- Acquire knowledge from appropriate biomedical engineering sources and integrate the information with previously known facts and techniques to increase scientific merit of assigned tasks. (ABET 7)

**ABET Outcomes:** The course objectives will map to the following ABET outcomes:

- 3) An ability to communicate effectively with a range of audiences
- 4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- 7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Professionalism:**

- Frequent interaction (dialogue, discussion in small groups) is part of the course. You are expected to participate and be respectful during these interactions.
- Announcements may be given through Canvas – you are responsible for checking Canvas regularly.
- Attendance at all class meetings is required and is part of your grade.
- Class begins promptly at 9:30 am. Consistently showing up late will affect your grade.
- If you need to miss class, let me know ahead of time. Do not ask for my notes, speak to a classmate about getting the notes. Missing a class will not excuse you from the comprehension checks during future classes.

**Face Mask Requirement:**

An individual in this course has a documented need for face coverings to be required in this course. Without divulging personal or identifying information, such a documented need might be that a member of their household is unable to be vaccinated or has a health condition that makes vaccines less effective for them. As a result, the College of Agricultural Science and Natural Resources has determined that face coverings will be required in this course. If you are unwilling to comply with this requirement, please visit with your advisor about different sections or possible alternative courses that you might take in lieu of this one.

## TENTATIVE CLASS SCHEDULE

(subject to change)

| <b>Date</b> | <b>Topic</b>  | <b>Speaker</b>        | <b>Assignments turned in</b>   |
|-------------|---|-----------------------|--|
| 8/24        | Introduction, Define BME  | Iverson               | Beginning of the Semester Survey                                     |
| 8/26        | History of BME  | Iverson               |  |
| 8/31        | Engineering Design  | Iverson               | Letter to instructor   |
| 9/2         | Biomedical Sensors  | Iverson               |  |
| 9/7         | Biomedical Sensors  | Iverson               |  |
| 9/9         | EKG lab   | Iverson               |  |
| 9/14        | Bioelectricity  | Bashford              | Engineering design and Sensors<br>Discussion post 1                  |
| 9/16        | Bioelectricity  | Bashford              | EKG Lab Report   |
| 9/21        | Electric stimulation lab  | Iverson               | Electric Stimulation Pre-Lab questions                               |
| 9/23        | Biomechanics  | Tomasevicz<br>- video | Bioelectricity Assignment  |
| 9/28        | Biomechanics  | Tomasevicz<br>- video | Electric Stimulation Lab Report                                      |
| 9/30        | Force plate lab   | Iverson               |  |
| 10/5        | Medical Imaging   | Kievit                | Biomechanics Assignment  |
| 10/7        | NO CLASS - BMES   |                       | Force Plate Lab Report   |
| 10/12       | Medical Imaging   | Kievit                | Final Project Abstracts  |
| 10/14       | Nanotechnology  | Iverson               | Discussion post 2  |
| 10/19       | Fall Break  |                       |  |
| 10/21       | Nanotechnology  | Iverson               | Medical Imaging Assignment   |
| 10/26       | Cardiovascular Mechanics  | Iverson               |  |
| 10/28       | Biomaterials  | Wachs                 | Nanotechnology Assignment  |
| 11/2        | Biomaterials  | Wachs                 |  |
| 11/4        | Tissue Engineering  | Pannier               | Cardiovascular Mechanics Assignment                                  |
| 11/9        | Tissue Engineering  | Pannier               |  |
| 11/11       | Biomedical Ethics 1   | Iverson               | Questions for Career Panel   |
| 11/16       | Biomedical Careers  | Iverson               | Biomaterials and Tissue Engineering<br>homework<br>Discussion post 3 |
| 11/18       | Biomedical Ethics 2   | Iverson               | Ethics Assignment part 1   |
| 11/23       | Iverson office hours - help with last minute final project issues |                       | Final Report, Oral presentation video and question for classmates    |
| 11/25       | Thanksgiving!   |                       |  |
| 11/30       | no class - watch student videos                                   |                       |  |
| 12/2        | no class - watch student videos                                   |                       | Careers homework   |
| 12/7        | no class - watch student videos                                   |                       | 18/35 student videos reviewed  |
| 12/9        | no class - watch student videos                                   |                       | Ethics Assignment part 2   |
| 12/15       | no class  | Final<br>(10 - noon)  | 35/35 student videos reviewed and End of Semester Survey             |

## **Diversity & Inclusion**

The University of Nebraska-Lincoln does not discriminate on the basis of race, ethnicity, color, national origin, sex (including pregnancy), religion, age, disability, sexual orientation, gender identity, genetic information, veteran status, marital status, and/or political affiliation.

## **Trespass Policy (Regents' Policy 6.4.7)**

The areas of University academic, research, public service, and administrative buildings of the University used for classrooms, laboratories, faculty and staff offices, and the areas of University student residence buildings used for student living quarters are not open to the general public. Any person not authorized to be or remain in any such building area will be deemed to be trespassing on University property and may be cited and subject to prosecution for criminal trespass in violation of Neb. Rev. Stat. 28-520 or 28-521.

## **Academic Honesty**

Academic honesty is essential to the existence and integrity of an academic institution. The responsibility for maintaining that integrity is shared by all members of the academic community. The University's Student Code of Conduct addresses academic dishonesty. Students who commit acts of academic dishonesty are subject to disciplinary action and are granted due process and the right to appeal any decision. See Student Code of Conduct, Article III, Section B. at <https://stuafs.unl.edu/DeanofStudents/Student%20Code%20of%20Conduct%20May%20Rev%202014%20a.pdf>

## **Services for Students with disabilities**

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can discuss options privately. To establish reasonable accommodations, I may request that you register with Services for Students with Disabilities (SSD). If you are eligible for services and register with their office, make arrangements with me as soon as possible to discuss your accommodations so they can be implemented in a timely manner. SSD contact information: 232 Canfield Admin. Bldg.; 402-472-3787; [acontreras3@unl.edu](mailto:acontreras3@unl.edu)

## **Fire, Internal Hazardous Materials Release**

- Always evacuate if the fire alarm sounds.
- In the event of an evacuation, gather your personal belongings quickly (purse, keys, cell phone, NCard, etc.) and proceed to the nearest exit.
- Do not use the elevator.
- Move away from the problem, use alternative exits.
- Help those who need assistance moving.
- Be ready to be guided by additional instructions.

**Tornado Warning:** When sirens activate, move to the lowest, interior area of a building or designated tornado shelter.

- Stay away from windows.
- Stay near inside wall when possible.
- Keep calm. Even though a warning is issued, the chance of a tornado striking your building or location is slight.

## **Hostile Intruder:**

- Remain calm.
- If it is possible to flee the area safely and avoid danger, do so.
- Notify anyone you encounter to exit the building immediately. Evacuate to a safe area away from the danger and take protective cover. Stay there until help arrives.
- Call UNL Police Department or 9-1-1 with your location if possible. If you cannot get through by phone and have text message capability, text University Police at 41513. Enter the letters **UNLPD** and then type your message. Dispatch will receive and respond to the message.
- If flight is impossible, secure yourself in your space. Barricade doors and block windows. Turn off all the lights, close blinds and close and lock all windows and lock and barricade all doors.

- Seek protective cover for yourself and any others (concrete walls, thick desks, filing cabinets may protect you from bullets).
- Keep calm, quiet and out of sight.
- Silence cell phones (mute or turn off cell phone ringer). Consider turning off radios and computer monitors.
- Do not answer the door. If you do not recognize the voice that is giving instructions, do not change your status (stay put). Unknown or unfamiliar voices may be false and designed to give false assurances.
- Place signs in exterior windows to identify the location of injured persons.
- **Do Not Approach Emergency Responders**—let them come to you.
- Remain where you are until an "all clear" instruction is given by an authorized known voice.

**Evacuate:** if there is a safe escape path, leave belongings behind, keep hands visible and follow police officer instructions.

**Hide out:** If evacuation is impossible secure yourself in your space by turning out lights, closing blinds and barricading doors if possible.

**Take action:** As a last resort, and only when your life is in imminent danger, attempt to disrupt and/or incapacitate the active shooter.

**UNL Alert:** Notifications about serious incidents on campus are sent via text message, email, unl.edu website, and social media. For more information go to: <http://unlalert.unl.edu>.

**Additional Emergency Procedures** can be found here:

[http://emergency.unl.edu/doc/Emergency\\_Procedures\\_Quicklist.pdf](http://emergency.unl.edu/doc/Emergency_Procedures_Quicklist.pdf)