

Biomedical Engineering 325: Biomedical Engineering Laboratory II
Spring 2022

Location: SECC 172; Lecture: F 1:00-1:50pm; Lab: 2:00-4:50pm

Instructor: Dr. Jesse Placone

Office: SECC 352

Office Phone: 610-436-2832

E-mail: jplacone@wcupa.edu (Please include course title in subject line)

Office hours: Tuesday 1-3pm; Wednesday 1-3pm; Thursday 1-2pm; office hours also available by appointment

Instructor: Dr. Zhongping Huang

Office: SECC 304

Office Phone: 610-436-6932

E-mail: zhuang2@wcupa.edu (Please include course title in subject line)

Office hours: Monday 10 am - 12 pm; Tuesday: 3:30 pm - 4:30 pm; Thursday: 4 pm - 5 pm

Course Description:

This course is the continuation of BME 315. Students will perform a series of laboratory experiments. A project will be conducted at the end of the semester.

The series of laboratory experiments will be based on major concepts in the core BME curriculum such as Biomechanics, Biomedical Instrumentation, and Biotransport. The final project will be a group-led project where you will design and carry out an experiment of your choosing relevant to the topics covered in this course. The findings from this final project will be presented at the end of the semester.

Required Materials:

- A laboratory notebook
- A computer with internet connectivity
- A computer that is able to run IMAGEJ or FIJI (more information will be posted to D2L)
- A computer that is able to run Matlab
- A computer with Microsoft Office Suite (free from the University)

Prerequisites:

BME110, BIO265, and BME315 are required to enroll in the class unless specific permission is given by the instructor.

Course Student Learning Outcomes:

Biomedical Engineering 325 is the second of a series of labs. Through laboratory experiments and laboratory reports, the students will have the opportunity to meet the outcomes and goals listed below.

- The student will be able to effectively communicate scientific knowledge.
- The student will be able to conduct common biomedical engineering experiments and analyze/interpret data.
- The student will be able to think critically and analytically.

These will be assessed through lab module write-ups, and the final presentation and project.

Program Goals/ABET Student Outcomes:

- Student Outcome #2: an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (Final Presentation and Project)
- Student Outcome #3: an ability to communicate effectively with a range of audiences. (Final Presentation and Project)

- Student Outcome #5: an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. (Final Project and Presentation)
- Student Outcome #6: an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. (Labs and Final Project).
- Student Outcome #7: an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. (Labs, Final Project, and Presentation)

Meeting and Assessing Student Learning Outcomes:

- Student learning outcomes will be achieved through interactive laboratory modules and laboratory lectures, and students working on laboratory writeups, and as teams on a final project/presentation. The primary form of assessment in this course will be the laboratory module write-ups and the final project/presentations.

Course Web Page:

This course has a D2L website associated with it. All course documents and announcements will be posted on D2L.

Evaluation and Grading:

Participation:	15%
Lab Write-ups: (6 x 10%)	60%
Final Project/Presentation:	25%

Experiments:

The experiments will be assigned to your individual groups as follows. Given that specialized equipment is needed for each module, your group may not necessarily follow this list in order. However, the lab modules will follow a logical progression and will provide hands-on learning experiences to supplement material from the core BME courses.

Lab 1: Electrocardiography (ECG/EKG)

Lab 2: Electromyography (EMG)

Lab 3: Cardiac Output and Breathing

Lab 4: Gait Analysis with MATLAB

Lab 5: FFT and Filtering

Lab 6: Cell Culture and Biomaterials

Attendance Policy:

Because most of the learning objectives of this course are met through conducting experiments in a lab, Attendance is critical to your success. Attendance will be taken at the start of each class period. Excused absences are limited to those due to participation in University- sanctioned events (see policy in the WCU undergraduate catalog) or those accompanied by written confirmation from a doctor, the Dean of Students, etc. If you are sick, you **MUST** obtain a doctor's note. Finally, whether your absence is excused or unexcused (or if you are late to class), you will be responsible for any material covered and any announcements that were made in class that day.

Preparation:

Reading assignments including journal articles, relevant protocols, and procedures will be assigned prior to each lab. For your safety and the safety of others, it is expected that these materials are read prior to carrying out any laboratory experiments. If anything is unclear, please bring it up with the instructor preferably in the lab lecture so that it may be clarified for the entire class.

Participation:

As a group work based laboratory, it is expected that all students will contribute to the data acquisition, interpretation, and write-ups based upon their findings. The hands-on experiences with the techniques learned in this series of courses is instrumental for preparing students for biomedical engineering careers. Participation will be assessed by the instructor based upon engagement with the activities and the group. Peer-evaluations of group member contributions may also be used. Participation in each lab including the final project will be equally weighted. Students will earn up to 3 points per lab.

Lab Write-up Policy:

Lab modules will be evaluated on an individual basis with the exception of the final project. In this course, you will develop effective communication skills to disseminate scientific knowledge. We will utilize peer-reviews in addition to critiques from your instructor to improve the submitted documents as the semester progresses. All sources should be properly cited and should be from respected sources (e.g. Journal Articles, Textbooks, and Reviews). It is suggested that you use a reference manager software such as EndNote Web which is provided through the University Library Services to help you find, manage, and incorporate your references into your submitted documents.

Final Project and Presentation

The final project will be a group-led experiment building upon the knowledge obtained through this course as well as the core BME courses. Each group will be responsible for designing and carrying out a final project over several weeks at the end of the semester. Peer evaluations will be used to provide critiques and suggestions prior to carrying out the proposed work. The final technical document covering the necessary background, methods, results and discussion of the data collected will be submitted at the end of the semester and the work will be presented to the entire class.

Late/Missing Work:

You are expected to turn in every assignment by the deadline. The final project is a group project. It is the responsibility of the team to effectively work together to submit the assignment on time. Please communicate with the instructor ahead of time if there are any unforeseen circumstances. For the first late assignment, a warning will be given. For each subsequent late assignment, there will be a deduction of 5% for each day that the assignment is late.

Letter grade scale:

Grade	Quality Points	Percentage Equivalents	Interpretation
A	4.00	93-100	Excellent
A-	3.67	90-92	Excellent
B+	3.33	87-89	Superior
B	3.00	83-86	Superior
B-	2.67	80-82	Superior
C+	2.33	77-79	Average
C	2.00	73-76	Average
C-	1.67	70-72	Average
D+	1.33	67-69	Below Average
D	1.00	63-66	Below Average
D-	0.67	60-62	Below Average
F	0	< 60%	Failure

Refer to the Undergraduate Catalog for description of NG (No Grade), W, Z, and other grades.

Bibliography: Additional resources that may be of interest:

1. Fundamentals of Momentum, Heat, and Mass Transfer, James Welty, Gregory L. Rorrer, David G. Foster. 7th Edition, Wiley 2019.
2. Fundamentals of Engineering Thermodynamics, M.J. Moran & H.N. Shapiro, 9th Edition, John Wiley & Sons, 2020.

BME 325 Spring 2022, Tentative Course Schedule

The following schedule is subject to change at the discretion of the instructor. Every effort will be made to announce changes in advance, but students are responsible for changes.

The schedule below is about the pre-lab lectures and additional material that we will cover.

Week	Lab Module	Topics Covered in Lecture	Deadlines
1			
2		General Safety Overview	
3	Lab 1	Introduction to LabView	
4	Lab 2	Introduction to Matlab	Lab 1 Due
5	Lab 3	Matlab toolkits	Lab 2 Due
6	Lab 4	Final Project Discussion	Lab 3 Due
7	Lab 5	Peer Review of Final Project Abstracts	Lab 4 Due
8	Spring Break	Spring Break	
9	Lab 6		Lab 5 Due; Draft of Final Abstract Proposal
10	Lab 6	Peer Evaluations of Final Project Technical Document	
11	Planning of Final Project	How to Structure and Give Scientific Presentations	Lab 6 Due; Draft of Technical Document
12	Final Project	Collection of Final Project Data	
13	Final Project	Collection of Final Project Data	
14	Final Project		Final Project Technical Document Due
15		Final Presentations	Final Project Due
16		No Lab	

Statements Common to All WCU Undergraduate Syllabi:

ACADEMIC & PERSONAL INTEGRITY

It is the responsibility of each student to adhere to the university's standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Other violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another's work and/or using ideas of another and presenting them as one's own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Proof of academic misconduct can result in the automatic failure and removal from this course. For questions regarding Academic Integrity, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to the Department Undergraduate Handbook, the Undergraduate Catalog, the Ram's Eye View, and the University website at www.wcupa.edu.

STUDENTS WITH DISABILITIES

If you have a disability that requires accommodations under the Americans with Disabilities Act (ADA), please present your letter of accommodations and meet with me as soon as possible so that I can support your success in an informed manner. Accommodations cannot be granted retroactively. If you would like to know more about West Chester University's Services for Students with Disabilities (OSSD), please visit them at 223 Lawrence Center. Their phone number is 610-436-2564, their fax number is 610-436-2600, their email address is ossd@wcupa.edu, and their website is at <https://www.wcupa.edu/universityCollege/ossd/>. In an effort to assist students who either receive or may believe they are entitled to receive accommodations under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, the University has appointed a student advocate to be a contact for students who have questions regarding the provision of their accommodations or their right to accommodations. The advocate will assist any student who may have questions regarding these rights. The Director for Equity and Compliance/Title IX Coordinator has been designated in this role. Students who need assistance with their rights to accommodations should contact them at 610-436-2433.

EXCUSED ABSENCES POLICY

Students are advised to carefully read and comply with the excused absences policy, including absences for university-sanctioned events, contained in the WCU Undergraduate Catalog. In particular, please note that the "responsibility for meeting academic requirements rests with the student," that this policy does not excuse students from completing required academic work, and that professors can require a "fair alternative" to attendance on those days that students must be absent from class in order to participate in a University-Sanctioned Event.

REPORTING INCIDENTS OF SEXUAL VIOLENCE

West Chester University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to comply with the requirements of Title IX of the Education Amendments of 1972 and the University's commitment to offering supportive measures in accordance with the new regulations issued under Title IX, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. **Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred to the person designated in the University Protection of Minors Policy.** Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at:

<https://www.wcupa.edu/admin/diversityEquityInclusion/sexualMisconduct/default.aspx>

INCLUSIVE LEARNING ENVIRONMENT AND ANTI-RACIST STATEMENT

Diversity, equity, and inclusion are central to West Chester University's mission as reflected in our [Mission Statement](#), [Values Statement](#), [Vision Statement](#) and [Strategic Plan: Pathways to Student Success](#). We disavow racism and all actions that silence, threaten, or degrade historically marginalized groups in the U.S. We acknowledge that all members of this learning community may experience harm stemming from forms of oppression including but not limited to classism, ableism, heterosexism, sexism, Islamophobia, anti-Semitism, and xenophobia, and recognize that these forms of oppression are compounded by racism.

Our core commitment as an institution of higher education shapes our expectation for behavior within this learning community, which represents diverse individual beliefs, backgrounds, and experiences. Courteous and respectful

behavior, interactions, and responses are expected from all members of the University. We must work together to make this a safe and productive learning environment for everyone. Part of this work is recognizing how race and other aspects of who we are shape our beliefs and our experiences as individuals. It is not enough to condemn acts of racism. For real, sustainable change, we must stand together as a diverse coalition against racism and oppression of any form, anywhere, at any time.

Resources for education and action are available through WCU's [Office for Diversity, Equity, and Inclusion](#) (ODEI), DEI committees within departments or colleges, the student [ombudsperson](#), and centers on campus committed to doing this work (e.g., [Dowdy Multicultural Center](#), [Center for Women and Gender Equity](#), and the [Center for Trans and Queer Advocacy](#)).

Guidance on how to report incidents of discrimination and harassment is available at the University's [Office of Diversity, Equity and Inclusion](#).

EMERGENCY PREPAREDNESS

All students are encouraged to sign up for the University's free WCU ALERT service, which delivers official WCU emergency text messages directly to your cell phone. For more information, visit www.wcupa.edu/wcualert. To report an emergency, call the Department of Public Safety at 610-436-3311.

ELECTRONIC MAIL POLICY

It is expected that faculty, staff, and students activate and maintain regular access to University provided e-mail accounts. Official university communications, including those from your instructor, will be sent through your university e-mail account. You are responsible for accessing that mail to be sure to obtain official University communications. Failure to access will not exempt individuals from the responsibilities associated with this course.

BASIC NEEDS STATEMENT

WCU is committed to ensuring that all students are able to reach their full academic potential. We know that basic needs are essential for effective learning, and we are working to address economic insecurity among our students in a number of ways. In particular, the WCU Resource Pantry is open to all students who lack access to food and supplies. Resources are also available for students facing housing insecurity. Please contact the Office of Service-Learning & Volunteer Programs for more information. As these factors directly affect academics, students who are comfortable doing so should contact faculty for further support.