

## **Introduction to Biological Engineering**

ABE 2012C

**Class Periods:** MW 10:40-11:30 am (period 4)

**Lab Periods:** M 3:00-3:50 pm OR 4:05-4:55 pm (period 8 OR 9)

**Location:** Online via Zoom (Contact instructor for link)

**Academic Term:** Fall 2020

### ***Instructor:***

Dr. Ana Martin-Ryals

admartin@ufl.edu

(352) 294-6708

Office Hours: MW 11:30 am-12:30 pm and by appointment. Office hours will be held online via Zoom.

***Teaching Assistant/Peer Mentor/Supervised Teaching Student:*** none

### ***Course Description***

3 Credits. Introduces the process of design along with approaches to solving engineering problems, manipulations and presentations of engineering data and applied engineering concepts. (WR)

### ***Course Pre-Requisites / Co-Requisites***

Prerequisite: MAC 2311

### ***Course Objectives***

- Students will be able to describe what biological engineering is and the different areas of specialization
- Students will be able to apply basic mathematics, science and engineering principles to solve biological engineering problems
- Students will become familiar with and be able to apply various software, instrumentation, and equipment used in engineering
- Students will develop and apply teamwork and communication skills
- Students will be able to recognize ethical and professional responsibilities in engineering situations
- Students will be able to identify and explain their academic and career goals

### ***Materials and Supply Fees***

None

### ***Required Textbooks and Software***

**Arduino Starter Kit - English Official Kit With 170 Page Book** - this will be required for each student. You can wait until after the first week of class to purchase your kit. This is the same kit that is used in EGN2020C - Engineering Design and Society and EEL3003 - Elements of Electrical Engineering. Each student should purchase their own Arduino Starter Kit. The kit is not sold in the UF Bookstore; you need to obtain it online from:

Arduino.cc: <https://store.arduino.cc/usa/arduino-starter-kit> (Links to an external site.)

OR

Amazon (fast shipping if you have Amazon Prime): [https://www.amazon.com/Arduino-Starter-Kit-English-Official/dp/B009UKZV0A/ref=sr\\_1\\_3/141-4678897-3293920?ie=UTF8&qid=1545066950&sr=8-3&keywords=arduino+starter+kit](https://www.amazon.com/Arduino-Starter-Kit-English-Official/dp/B009UKZV0A/ref=sr_1_3/141-4678897-3293920?ie=UTF8&qid=1545066950&sr=8-3&keywords=arduino+starter+kit) (Links to an external site.)

You only need one kit, so order from one place or the other. This kit is very useful. If you ever wanted to get into Arduino or tinkering/inventing, it is very easy to use and once you get started, you can build and create all kinds of small electronic items!

### **Recommended Materials**

- Cross, Nigel. 1989. Engineering Design Methods. John Wiley & Sons, Chichester. 159 pp. (Sci. Lib. TA174.C76 1989)
- Eide, Arvid R., Roland D. Jenison, Lane H. Mashaw and Larry L. Northup. 1986. Engineering Fundamentals and Problem Solving (2nd Ed.). McGraw-Hill, Inc., New York. 492 pp. (Sci. Lib. TA147.E52 1986)
- Grant, Eugene L., W. Grant Ireson and Richard S. Leavenworth. 1990 Principles of Engineering Economy (8th Ed.). John Wiley and Sons, New York. 624 pp. (Sci. Lib. TA177.4.G7 1990)
- Lindeburg, Michael R. 2000, FE Review Manual. Professional Publications, Inc., Belmont. (Sci. Lib TA159.L5733 2000)

### **Professional Component (ABET):**

This course contributes 3 credit hours toward meeting the minimum 48 credit hours of Engineering Topics required in the basic-level curriculum for the Bachelor of Science Degree in Biological Engineering.

### **Relation to Program Outcomes (ABET):**

This course addresses the following ABET outcomes, and assesses outcomes 4 and 7.

<b>Outcome</b>	<b>Coverage*</b>
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
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	Low
3. An ability to communicate effectively with a range of audiences	Medium
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	High
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	High
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	Medium
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	Medium

\*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered in the course.

### **Attendance Policy, Class Expectations, and Make-Up Policy**

- Attendance is optional though highly encouraged. Attendance will be taken for each class and lab session. You will achieve up to full credit for your performance with no more than 5 absences. With 6 to 10 absences you will receive the next lower grade. With 10 to 15 absences you will receive the second lower grade. 16 or more absences will result in an E grade for the course. Excused absences must be consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation.
- All class meeting will be recorded. See the Online Course Recoding Policy on the next page. These recordings will be posted on the course Canvas site for students to refer back to and for students who are unable to attend live.
- All assignments/class deliverables are due by 11:59 pm on the day specified for full credit. 10% deduction/day thereafter. Maximum deduction is 50%. For any partial credit, assignments that cover any material on an exam must be turned in at least two days before the exam on which the material is covered.
- Exams will take place during the regularly scheduled class time and will be administered via Zoom.
- No make-up exams will be given except for valid medical reasons or unless prior arrangements have been made.

### ***Online Course Recording***

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

### ***Course Schedule***

This is a tentative schedule and is subject to modification depending on the progress of the course and guest speaker schedules.

Week 1:	8/31	Course Introduction and Orientation
	9/2	Overview of Biological Engineering
Week 2:	9/7	Labor Day – no class
	9/9	Engineering Problem Solving: Units, Measurement and Estimation
Week 3:	9/14	Engineering Problem Solving: Graphing and Curve Fitting <u>Lab #1</u> – Graphing with Excel
	9/16	Guest Speaker – Erin Lin, Career Connections Center & Ping Neo, Study Abroad
Week 4:	9/21	Engineering Problem Solving: Engineering Design Process <u>Lab #2</u> – Units and Measurement
	9/23	Guest Speaker – UF Center for Undergraduate Research (CUR)
Week 5:	9/28	Professional Issues: Engineering Licensure <u>Lab #3</u> – Biosensors
	9/30	Guest Speaker – Dr. Bruce Welt, Careers in Packaging
Week 6:	10/5	Professional Issues: Engineering Ethics <u>Lab #4</u> – Life Cycle Assessment
	10/7	Guest Speaker – Del Bottcher, Soil and Water Engineering Technology
Week 7:	10/12	Professional Issues: Teamwork <u>Lab #5</u> – Plant-Space Biology
	10/14	Guest Speaker – Barry Jacobson, Solar Impact
Week 8:	10/19	<b>Exam 1</b> <u>Lab #6</u> – Fermentation
	10/21	Guest Speaker – Shawn Webber, Sustainable Design
Week 9:	10/26	Statistics: Descriptive Statistics and Linear Regression <u>Lab #7</u> – Water Resources
	10/28	Guest Speaker – Erin Webb, Oak Ridge National Laboratory
Week 10:	11/2	Statistics: Probability Functions and Normal Distribution <u>Lab #8</u> – Remote Sensing and GIS
	11/4	Guest Speaker – Graduate Student Panel
Week 11:	11/9	Statistics: Confidence Intervals and Hypothesis Testing <u>Lab #9</u> – Wastewater Treatment
	11/11	Veteran’s Day – no class

- Week 12: 11/16 Engineering Economics: Introduction, Simple vs. Compound Interest  
Lab #10a – Python  
 11/18 Engineering Economics: Present and Future Worth  
 Goals Essay due this week
- Week 13: 11/23 Engineering Economics: Decision Making  
Lab # 10b – Python  
 11/26 Day before Thanksgiving – no class
- Week 14: 11/30 **Exam 2**  
Lab # 11a – Arduinos  
 12/2 Team Project Presentations
- Week 15: 12/7 Team Project Presentations  
Lab # 11b – Arduinos  
 12/9 Team Project Presentations
- Week 16: 12/16 Finals week – Team Project Reflection due this week

### ***Evaluation of Grades***

<b>Assignment</b>	<b>Total Points</b>	<b>Percentage of Final Grade</b>
Assignments (10)	250	25%
Discussion Posts (8)	80	8%
Labs (11)	220	22%
Exam 1	100	10%
Exam 2	100	10%
Goals Essay	100	10%
Team Project	150	15%
	1000	100%

### ***Grading Policy***

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### ***Students Requiring Accommodations***

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### ***University Honesty Policy***

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, [rbielling@eng.ufl.edu](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### ***Software Use***

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### ***Student Privacy***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

## **Campus Resources:**

### Health and Wellness

#### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

#### **Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance](http://www.ufl.edu/title-ix), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

#### **Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

### Academic Resources

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto:Learning-support@ufl.edu).  
<https://lss.at.ufl.edu/help.shtml>.

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.

<https://teachingcenter.ufl.edu/>.

**Writing Studio**, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.

<https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** <https://care.dso.ufl.edu>.

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.