

## **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:** Frazier-Rogers Hall Room 129 (class) and 211 (lab)

**Academic Term:** Fall 2023

### ***Instructor:***

Dr. Ana Martin-Ryals

admartin@ufl.edu

(352) 294-6708

Office Hours: MW 11:30 am-12:30 pm or by appointment, office 115 Frazier-Roger's Hall

### ***Supervised Teaching Student:***

Please contact through the Canvas website

- Michelle Ezequelle, mezequelle@ufl.edu

### ***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, the different areas of specialization, and its connection to sustainable development.
- 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***

None

### ***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)
- 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.

| Outcome   | Coverage* |
|---|-----------|
| 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 or assessed in the course.

**Evaluation of Grades**

| Assignment              | Total Points | Percentage of Final Grade |
|-------------------------|--------------|---------------------------|
| Assignments (10)        | 500          | 50%                       |
| Labs/Guest Speakers (5) | 50           | 5%                        |
| Exams (2)               | 200          | 20%                       |
| Team Project            | 250          | 25%                       |
|                         | 1000         | 100%                      |

**Grading Policy**

| Percent     | Grade | Grade Points |
|-------------|-------|--------------|
| 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>

**Course Schedule** (Subject to modification depending on progress of the course and lab host/guest speaker schedules.)

| Week | Module                             | Topics Covered  | To Do:                           |
|------|------------------------------------|---|----------------------------------|
| 1    | Overview of Biological Engineering | Overview of Biological Engineering Concentrations<br>Sustainability, Circular Bioeconomy, Systems Thinking<br><i>Lab 1: Sustainable Development Goals</i> | Syllabus Quiz<br>Assignment 1    |
| 2    | Engineering Problem Solving        | The Engineering Design Process  | Bridge Prototype                 |
| 3    |                                    | Dimensional Analysis, Measurement and Error<br><i>Lab 2: Introduction to Jupiter Notebooks and Python</i>   | Assignment 2                     |
| 4    | Professional Issues                | Engineering Licensure and Academic Planning<br><i>Lab 3: Bridge Design Testing</i>  | Assignment 3                     |
| 5    |                                    | Engineering Ethics<br><i>Lab 4: Measurement and Error</i>   | Assignment 4                     |
| 6    |                                    | Working in Teams and Project Management<br><i>Review Session for Exam 1</i>   | Assignment 5                     |
| 7    | Statistics                         | <b>Exam 1</b><br>Regression Analysis<br><i>Lab 5: Field and Fork Gardens Tour</i>   | Team Project<br>Contract         |
| 8    |                                    | Probability Distributions and Confidence Intervals<br><i>Lab 6: Food Science Pilot Lab Tour</i>   | Assignment 5                     |
| 9    |                                    | Hypothesis Testing<br><i>Lab 7: Controlled Environment Agriculture</i>  | Assignment 6                     |
| 10   | Engineering Economics              | Time Value of Money and Interest<br><i>Lab 8: Hyperspectral Imaging Analysis</i>  | Assignment 7                     |
| 11   |                                    | Guest Speakers<br><i>Lab 9: Robotics and Automation</i>   | Assignment 8                     |
| 12   |                                    | Life Cycle Costing and Economic Decision Making<br><i>Lab 10: Water Resource Engineering</i>  | Assignment 9                     |
| 13   | Team Projects                      | Work on Team Projects   | Team Project Poster              |
| 14   |                                    | Present Team Projects   | Study for Exam 2                 |
| 15   |                                    | <b>Exam 2</b>   | Team Project<br>Reflection Essay |

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

- Attendance is highly encouraged. Attendance will be taken for each class and lab. 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.
- Assignments are due by 11:59 pm on the day specified for full credit. After the due date, a 5% deduction/day will be applied to any late submissions. Maximum deduction is 50%.
- Lab activities and guest speakers are scheduled throughout the semester to provide students with a better understanding of biological engineering topics and career planning. Students must submit a brief reflection on a total of 5 labs or guest speaker experiences to receive full credit. These reflections can be submitted at any time throughout the semester.
- Exams will be given during regular class meeting times. No make-up exams will be given except for valid medical reasons or unless prior arrangements have been made.

### ***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.ua.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.ua.ufl.edu/public-results/>.

### ***In-Class Recording***

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

### ***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/process/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.

- 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>

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

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values, including the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of race, creed, color, religion, age, disability, sex, sexual orientation, gender identity and expression, marital status, national origin, political opinions or affiliations, genetic information, and veteran status.

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 Ms. Daphne Flournoy: [dflournoy@ufl.edu](mailto:dflournoy@ufl.edu) or Undergraduate Program Coordinator Dr. Ana Martin-Ryals: [admartin@ufl.edu](mailto:admartin@ufl.edu)
- HWCoe Human Resources, 352-392-0904, [student-support-hr@eng.ufl.edu](mailto:student-support-hr@eng.ufl.edu)

### **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:** <https://counseling.ufl.edu>, 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**, 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/>.

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

**Career Connections Center**, Reitz Union, 392-1601. Career assistance and counseling; <https://career.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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

**On-Line Students Complaints**: <https://distance.ufl.edu/getting-help/>; <https://distance.ufl.edu/state-authorization-status/#student-complaint>.