

Fundamentals and Applications of Biosensors
ABE 5038

Class Periods: T Period 4 (10:40 AM - 11:30 AM), R Periods 5-6 (10:40 AM - 12:35 PM)

Location: Frazier Rogers Hall, Room 283

Academic Term: Spring 2026

Email address: jireyes@ufl.edu Office location: 273 Frazier Rogers Hall

Instructor: Dr. Jose Reyes

Telephone: 352-273-2181 (8-5 pm, M-F)

Office hours: Tuesday 11:30 AM - 12:30 PM, or by appointment (preferably scheduled via email) in Room 273 Frazier Rogers or via Zoom as scheduled.

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Course Description:

Credits: 3

Provides a broad introduction to the field of biosensors, as well as an in-depth and quantitative view of biosensor design and performance analysis. Fundamental application of biosensor theory will be demonstrated, including biorecognition, transduction, signal acquisition, and post-processing/data analysis.

Pre-requisites/Co-requisites:

N/A

Course Learning Outcomes:

After taking this course students will be able to:

- Define and differentiate biosensors and biosensing.
- Explain the need for biosensors and biosensing.
- Explain biorecognition mechanisms.
- Quantify diffusion and reaction processes associated with biosensing.
- Explain the principles of electrochemical, optical, and acoustic transduction mechanisms
- Classify biosensors according to their sensing and transduction mechanisms.
- Apply principles of biology and organic chemistry to the immobilization of biorecognition elements onto transducers.
- List biosensor performance characteristics and explain their relevance.
- Describe the principles of electric circuits used for sensor data acquisition.
- Apply basic principles of signal amplification and filtering to maximize sensor signal to noise ratio.
- Identify existing and potential applications of biosensors in the food, agricultural, environmental, and biomedical fields*.

- Identify, read, critique, summarize, and present recent biosensor research literature*.
- Generate a list of development priorities for biosensor R&D*.
- Propose sound experiments to test and validate biosensor performance applying sound statistical tools*.
- Identify and analyze ethical conflicts associated to biosensors and biosensing and formulate sound guidelines for research and application of biosensors*.

*These learning outcomes involve group/team activities.

Material and Supply Fees: none

Required Textbooks and Software (see below)

Content will be available on Canvas or Provided by the Instructor

Course Schedule (topics vary by semester and may be modified with the intent of maximizing student learning)

Week, Dates	Topic
1, Jan 13 & 15	Introduction & Sensor Principles
2, Jan 20 & 22	Sensor Performance I
3, Jan 27 & 29	Sensor Performance II Biosensor Anatomy
4, Feb 3, & 5	Biorecognition I - Enzymes
5, Feb 10 & 12	Biorecognition II - Antibodies
6, Feb 17 & 19	Biorecognition III – Other – Exam 1
7, Feb 24 & 26	Transduction I - Electrochemical
8, Mar 3 & 5	Transduction II – Optical
9, Mar 10 & 12	Transduction III – Acoustic – other
	SPRING BREAK
10, Mar 24 & 26	– Exam 2
11, Mar 11 & Apr 2	Fabrication I – Enzyme immobilization - Fabrication II – Immuno-sensors
12, Apr 7 & 9	Applications / Innovations / Electronics, data acquisition, and analysis
13, Apr 14 & 16	Ethics in Biosensors and Biosensing
14, Apr 21	Student presentations / project
TBD	Exam 3 - <u>Final Exam Schedule</u>

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/> (Links to an external site.)

- As a general rule, any activity, action, or inaction that inhibits or limits a student's (self or other) learning is discouraged or prohibited.
- Attending and participating in class is required. Absences that are consistent with the university policies noted above will be excused. Attendance at classes will be taken at random and will be used for the attendance grade, each unexcused absence is 2.5% of the total grade up to 10%.
- Students are expected to abide by the deadlines for assignments. Late submissions will be penalized with a 20% deduction if submitted within 24 h of the deadline, a 50% deduction if submitted within 48 h, and will not be accepted afterward unless a valid justification that meets UF policies is provided.
- Use of office hours is encouraged. The instructor will try to accommodate other appointments that are scheduled via email at least one day in advance.
- The instructor will respond to emails typically, within a 24 h period during the work week.
- Students must adhere to the code of honor. In other words, no cheating is allowed. Students found copying, plagiarizing, etc. will be dismissed from the course with a failing grade. Activities in which students are expected to collaborate and share information will be clearly defined by the instructor.
- Students will make a final presentation at the end of the semester. The final presentation will represent 20% of the final grade. 10% will be assigned to the quality and comprehensiveness of the content of the presentation and 10% will be assigned to the communication quality and clarity. A detailed rubric for the presentations will be provided.

Grading Policy

Percent	Grade	Grade Points
93.5 - 100	A	4.00
89.5 - 93.4	A-	3.67
86.5 - 89.4	B+	3.33
83.5 - 86.4	B	3.00
79.5 - 83.4	B-	2.67
76.5 - 79.4	C+	2.33
73.5 - 76.4	C	2.00
69.5 - 73.4	C-	1.67
66.5 - 69.4	D+	1.33
63.5 - 66.4	D	1.00
59.5 - 63.4	D-	0.67
0 - 59.4	E	0.00

Graded Item	Weight
Exams (3)	30%
Final Presentation (1)	20%
Quizzes (3)	20%
Homework (4)	20%
Participation/Attendance	10%

GRADUATE STUDENT ADDITIONAL REQUIREMENTS

- Graduate students will prepare an additional review paper on a type of biosensor that is related to their graduate research. The written paper will account for half of the “Final Presentation” grade.
- 10% of the Graduate students’ exams will have questions that are more difficult than undergraduate exams.
- Exam bonus questions are not available for graduate students.

More information on UF grading policy may be found

at: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> (Links to an external site.)

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:

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 Coordinator
- HWCoe Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu

Disclaimer: The instructor reserves the right to modify this syllabus to improve student learning.