

ABE 5038: FUNDAMENTALS AND APPLICATIONS OF BIOSENSORS

- 1. Catalog Description:** 3 credits. The course is intended to provide a broad introduction to the field of biosensors, design and performance analysis. Fundamental application of biosensor theory will be demonstrated, including recognition, transduction, signal acquisition, and post processing/data analysis. Hands on demonstrations will be used sporadically throughout the semester to reinforce fundamental principles.
- 2. Pre-requisites and Co-requisites:** Graduate status is required for enrollment. It is recommended that the students have a basic background in biology and has taken at least one course beyond introductory biochemistry or equivalent. The topics of the interdisciplinary course take into consideration that students will be coming to the class from varied backgrounds. Proper background materials will be provided when needed. It is, however, the student's responsibility to see the instructor if he/she does not have sufficient background in a particular topic. In this case additional background materials and discussion can be provided or directed as needed.
- 3. Course Objectives:** Students should leave the course with a foundational understanding of current state of the art in biosensors as well as a basic skill set for continuation into advanced biosensor design. Topics are selected to emphasize agricultural, bioenvironmental, food safety, biosecurity, and biomedical applications.
- 4. Instructor:** Eric S. McLamore
 - a. Office location: 105 Rogers Hall
 - b. Telephone: 352-392-1864 x 105
 - c. E-mail address: emclamor@ufl.edu
 - d. Web site:
 - e. Office hours: M,W 1:00-2:00, W 11:00-12:00 or by appointment
- 5. Teaching Assistant:**

TBD
- 6. Meeting Times:**

Tues: Period 4 (10:40-11:30);

Thurs: 9:35-10:25 Period 4-5 (10:40-12:35)
- 7. Class/Laboratory Schedule:** Laboratories will be conducted throughout the semester as needed
- 8. Meeting Location:** Rogers Hall
- 9. Material and Supply Fees:** none
- 10. Textbooks and Software Required:** none
- 11. Recommended Reading:** Due to the multi-disciplinary nature of the course material, text and supporting information will be provided by the Instructor and will be taken from numerous textbooks and current

journal articles (journal articles will be selected by the instructor). Information from textbooks will be provided by the instructor in the form of electronic files, and selected material will be taken from the following textbooks:

Title: Analytical Electrochemistry
Author(s): J. Wang
Publication date: 2006
Edition: 3rd edition
ISBN: 13:978-0-471-67879-3
Publisher(s): Wiley

Title: Fundamentals of Photonics (download free from <http://spie.org/Publications/Book/784938>)
Author(s): C. Roychoudhuri
Publication date: 2008
Edition: 1st edition
ISBN: 9781628412710; Vol. TT79
Publisher(s): SPIE

Title: Rapid Review: Biochemistry
Author(s): J.W. Pelley and E.F. Goljan
Publication date: 2011
Edition: 3rd edition
ISBN: 978-0-323-06887-1
Publisher(s): Elsevier

12. Course Outline

PART 1

Lecture #1-Course overview

Lecture #2-The Biomolecular Realm and Introduction to Biosensing

Lecture #3-Sensor nomenclature

Lecture #4-Recognition and transduction

Lecture #5-Signal acquisition

Lecture #6-Performance characterization

TEST #1

PART 2

Lecture #7-Fundamentals of electrochemical sensing

Lecture #8-Fundamentals of optical sensing

Lecture #9-Materials, nanomaterials and biomaterials

Lecture #10-Immobilization basics

TEST #2

PART 3

Lecture #11-Whole cell, whole tissue and whole organism biosensors

Lecture #12-Applications of biosensors

FINAL EXAM

13. Attendance and Expectations: Attendance is vital to class participation and in-class discussion. Absences for which a medical or court excuse is provided (professional letterhead required) will be excused. Any significant tardy or early departure from class will be figured as an absence.

14. Grading:

Attendance and Participation	10%
Homework	15%
In Class Presentation	15%
Exam #1	20%
Exam #2	20%
Final Exam	20%

15. Grading Scale:

A	> 89.5 %
B	79.5 – 89.4 %
C	69.5 – 79.4 %
D	59.5 – 69.4 %
E	< 59.4 %

Graduate credit: For obtaining graduate credit, students must be currently enrolled as a graduate student. Students will be responsible for attending class, turning in all homework and exams, as well as analyzing a current peer reviewed journal article and giving an oral presentation. During this oral presentation, all graduate students must provide a comprehensive literature review to receive full credit. This literature analysis will count for 10% of the graduate student's grade, and failure to complete a literature analysis will result in a grade of "U" for the course.

16. Make-up Exam Policy: Make up exams must be scheduled with the instructor at least 24 hours in advance of the scheduled exam time. Consideration of make-up exams after this deadline will be by discretion of the instructor only.

17. Honesty Policy – All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

18. Accommodation for Students with Disabilities – Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

19. UF Counseling Services – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- University Counseling Center, 301 Peabody Hall, 392-1575, Personal and Career Counseling.
- SHCC mental Health, Student Health Care Center, 392-1171, Personal and Counseling.

20. Software Use – All faculty, staff and student 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.