Form UCC1
Florida Department of Education
Statewide Course Numbering System

# NEW COURSE TRANSMITTAL FORM

*(explanations on next page)*

## PART 1: TO BE COMPLETED BY THE INSTITUTION

| Institution Name: | Institutional Code: | Instructional Unit or Department Name, Department Code: |
|---|---|---|
| University of Florida | 001535 | Agricultural and Biological Engineering Department |

**Recommended SCNS Course Identification:**

Discipline (SMA) ABE ____ ____ Prefix ABE ____ ____ Level 5 ____ Course Number XXX ____ ____ Lab Code _____

**Institution's Course Title:** Recent Developments and Applications in Biosensors

**Effective Term and year course will first be offered:** Spring 2011

Amount of Credit: 3 | Contact hour base 3 or Headcount _____

If Repeatable Credit or Variable Credit:
_____ total repeatable credit allowed
_____ minimum / _____ maximum credit within a semester

Course Description (attach a course syllabus):

Introduction to biosensors, design and performance analysis. Fundamental application of biosensor theory will be demonstrated, including recognition, transduction, signal acquisition, and post processing/data analysis.

Mark all that apply:

| | | |
|---|---|---|
| Rotating Topic | ☐ yes | ☑ no |
| S/U Only | ☐ yes | ☑ no |
| Repeatable for Credit | ☐ yes | ☑ no |

Prerequisites: (This form does not update ISIS or registration prerequisite checking.)

At least senior status in engineering and background in biology including biomolecules.

Corequisites: none

**All faculty teaching this course have completed at least 18 graduate semester hours in the teaching discipline and hold at least a master's degree.** ☑ Yes ☐ No

Degree Type (Mark all that apply.):

☐ Associate of Arts ☑ Baccalaureate ☑ Graduate Study ☐ Other (specify):

Category of Instruction: ☐ Introductory ☐ Intermediate ☑ Advanced

Department Contact, Telephone Number, Email Address and PO Box: (Date)

Jim Leary, 352-392-1864 x. 115, DrLeary@ufl.edu PO Box 110570 8/27/10

College Contact, Telephone Number, Email Address and PO Box: (Date)

Mark Law, 352-392-0943, mlaw@eng.ufl.edu, PO Box 116550 8/27/10

## PART 2: TO BE COMPLETED BY THE FACULTY DISCIPLINE COMMITTEE REPRESENTATIVE

Approved Course Classification (Prefix, Number, Lab Code):

If not the same as recommended by institution, please explain:

SCNS Course Title (if new): _____

Decade Title (if new): _____

Century Title (if new): _____

Signature, Faculty Discipline Committee Representative: _____ Date: _____

# ABE 5XXX: FUNDAMENTALS AND APPLICATIONS OF BIOSENSORS

1. **Catalog Description:** 3 *credits (Spring, 2011).* 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.

2. **Pre-requisites and Co-requisites:** At least senior status is required for enrollment, and a passing grade in organic chemistry (CHE 2210/2211, EES4200, or equivalent) and differential equations (MAP 2302 or equivalent) is required. It is recommended that the students have a basic background in biology. 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, and biosecurity applications. Graduate students will be responsible for conducting a detailed review of current literature and provide a written report and oral presentation.

4. **Contribution of course to meeting the professional component for ABET**: Students will gain in depth knowledge of applied chemistry (inorganic and organic) and a fundamental knowledge of applied calculus-based physics and applied statistics.

5. **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: by appointment (8AM-5PM, M-F)

6. **Teaching Assistant:** None

7. **Meeting Times:** Tues: 9:30-11:10, Thurs: 9:30-10:20

8. **Class/Laboratory Schedule:** None

9. **Meeting Location:** Rogers Hall

10. **Material and Supply Fees:** none

11. **Textbooks and Software Required:** 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 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: Electrochemical Methods: Fundamentals and Applications
Author(s): Allen J. Bard; Larry R. Faulkner
Publication date: 2000
Edition: 2nd edition
ISBN: 13:978-0-471-04372-0
Publisher(s): Wiley

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

**12. Recommended Reading:** Other supporting material highly suggested includes:

*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*

| **13. Course Outline:** | **Week** |
|---|---|
| The Biomolecular Realm and Introduction to Biosensing | 1 |
| Biosensor Design and Performance Evaluation | 2 |
| Sensors, Detectors and Assays | 3 |
| Biological Recognition and Transduction | 4 |
| Fundamentals of Electroanalytical Chemistry | 5 |
| Fundamentals of Optics | 6 |
| Materials | 7 |
| Nanomaterials | 8 |
| Material Biocompatibility | 9 |
| Protein based biosensors/bioassays | 10 |
| Whole cell biosensors/bioassays | 11 |
| Whole organism biosensors/bioassays | 12 |
| Biosensors for Food and Biosecurity | 13 |
| Biosensors in the Environment | 14 |
| Advanced Biosensor Techniques | 15 |

**14. 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 a half absence.

**15. Grading:**

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

**16. Grading Scale:**

| | |
|---|---|
| A | > 90 % |
| B | 80 – 89 % |
| C | 70 – 79 % |
| D | 60 – 69 % |
| E | < 60 % |

**Graduate credit**: For obtaining graduate credit, students must be currently enrolled as a graduate student, and will be responsible for providing a critical analysis of current literature. This critical analysis will count for 25% of the graduate student's grade, and failure to turn in a critical analysis will result in a grade of "U" for the course. The critical analysis must consist of: (1) a detailed review of current literature (5% of total grade), (2) a written report (5% of total grade), and (3) an oral presentation (15% of total grade). See graduate credit handout for details. Undergraduate students are NOT required to conduct a critical analysis.

Undergraduate students, in order to graduate, must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. Graduate students, in order to graduate, must have an overall GPA of 3.0 or better (B or better). Note: a B- average is equivalent to a GPA of 2.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit:
http://www.registrar.ufl.edu/catalog/policies/regulationgrades.html

**17. 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.

**18. 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.

**19. 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.

**20. 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.

- Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161, sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601, career development assistance and counseling.

21. **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.

Treats application of electrochemical methods to elucidation of reaction mechanisms; double layer structure and surface processes, and their effects on electrode processes are developed from first principles; other key features include a chapter on operational amplifier circuits and electrochemical instrumentation, unique coverage of spectrometric and photochemical experiments, and Laplace transform and digital simulation techniques. Table of Contents. Introduction and Overview of Electrode Processes. Potentials and Thermodynamics of Cells. Kinetics of Electrode Reactions. Mass Transfer by Mig Book titleElectrochemical Methods: Fundamentals and Applications, 2nd Edition. Author. Allen J. Bard; Larry R. Faulkner.Â  Book solution electrochemical methods allen j bard larry r faulkner. Charles A. Trapp, Marshall Cady, Carmen Giunta-Studentâ€™s solutions manual to accompany Quanta, Matter & Change A Molecular Approach to Physical Chemistry-Oxford University Press, W.H. Freeman and Com. Preview text. Electrochemical Methods: Fundamentals and Applications is written by Allen J. Bard and Larry R. Faulkner (Department of Chemistry and Biochemistry, University of Texas at Austin) and published by John Wiley and Sons Inc. in 2001. Table of Contents. Introduction and Overview of Electrode Processes. Potentials and Thermodynamics of Cells. Kinetics of Electrode Reactions. Mass Transfer by Migration and Diffusion. Basic Potential Step Methods. Potential Sweep Methods. Polarography and Pulse Voltammetry. Controlled-Current Techniques. Methods Involving Forced Convectionâ€”Hydrodynamic Methods. Techni