

## **ABS-837 Biosensor & Chip Technologies (3-0)**

### **Educational Objectives**

1. On completion of this course, one should
  - a. Be able to link and extend basic engineering principles for development of bioanalytical device to a measurement problem in life sciences.
  - b. Understand the principles of linking cell components and biological pathways with energy transduction, sensing and detection.
  - c. Be able to understand basic configuration and distinguish among different biosensor systems
  - d. Demonstrate the associated technical limitations of performance
  - e. Be able to make design and select detection methods in response to measurement problem for use in biosensors.

### 2. **Course Outcomes**

- a. **Graduate students will be responsible for designing a small biosensor based on existing local measurable problems with a detailed review of current literature and provide a written report and oral presentation.**
- b. It will provide fundamental understanding to analytical solution to measurable problem in any areas.
- c. It will also equip the students to link biosystems to engineering principles and come up with a multidisciplinary, yet applied approach.

### 3. **Course Contents**

- a. Overview of Biosensors
- b. Fundamental elements of biosensor devices
- c. Engineering sensor proteins
- d. Electrochemical biosensors
- e. Electrochemical principles
- f. Amperometric biosensors and charge transfer pathways in enzymes

- g. Glucose biosensors
- h. Engineering electrochemical biosensors
- i. Optical Biosensors
- j. Optics for biosensors
- k. Attenuated total reflection systems
- l. Acoustic Biosensors
- m. Principles of acoustic biosensors
- n. Quartz crystal microbalance and its application to the life sciences
- o. Lab-on-chip technologies
- p. Microfluidic interfaces for biosensors
- q. DNA and protein microarrays
- r. Microfabricated PCR technology
- s. Diagnostics for the real world
- t. Communication and tracking in health monitoring
- u. Detection in resource limited settings
- v. Materials used for biosensor fabrications

4. **Recommended Books**

- a. Biosensors, E.A. Hall, John Wiley & Sons.
- b. Biosensors: Theory and Applications, Donald D. Buerk
- c. Chemical sensors and Biosensors, Eggins, Brian R., John Wiley and Sons.