1. ECE 527E (ECE 581B4): Biosensing: Affinity Sensors

2. 1 credits: 2-80 minute lecture sessions/week – 5 weeks

3. Tom Chen

4. None - readings and notes provided by instructor

5. Course Information
   a. Fundamentals of affinity sensor application and design, including optical and electrical approaches and technologies
   b. Prerequisites: BIOM 101 or LIFE 102; MATH 340, may be taken concurrently or MATH 345, may be taken concurrently; PH 142
   c. Selected Elective: Electrical Engineering; Computer Engineering

6. Goals for the Course
   a. Course Learning Outcomes
      i. Examine the basic DNA/RNA and protein structures, and their binding mechanisms
      ii. Describe biological recognition mechanism based on optical methods using fluorescent markers to determine specific binding, and electrical methods using capacitive and impedimetric changes of molecular structures due to binding
      iii. Compare and contrast affinity sensors and describe their performance parameters
      iv. Identify and describe the components of modern instrumentation employed for affinity sensing
   b. Student Outcomes
      1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
      2. An ability to apply the engineering design process to produce solutions that meet specified needs with consideration for public health and safety, and welfare, as well as global, cultural, social, environmental, and economic factors
      3. An ability to communicate effectively with a range of audiences
      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
      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
      6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
      7. An ability acquire and apply new knowledge as needed, using appropriate learning strategies

7. Topics Covered

Single and double strand DNA, RNA, protein, antibody, and antigen; binding affinity
Design of affinity sensors
Performance parameters of affinity sensors
Instrumentation used for affinity sensing
Bench-top impedance meter to perform certain DNA detection using the affinity sensing method