Electronic Biomedical Nanosensors (電子式生醫奈

米感測器)

Instructor : Yu-Lin Wang/王玉麟 (ylwang@mx.nthu.edu.tw)

Course level: graduate students

Course goals: The first goal is to learn the knowledge of biological systems, important biomolecules, and biological recognition. The second goal is to learn different electronic transducers and the incorporation of sensing elements and nano-materials for chemical or biological molecule detection.

Prerequisite: general chemistry and general physics

Text Book/ Reference book:

"Biochemistry", by R. H. Garrett and C. M. Grisham, Brooks/Cole, 4th Ed. 2010 (ISBN-13: 978-0-495-11464-2; ISBN-10:0-495-11464-2)

"Semiconductor Devices-Based Sensors for Gas, Chemical, and Biomedical Applications" by Fan Ren & Stephen J. Pearton, CRC Press, 2011 (ISBN : 978-1-4398-1387-4)

"Chemical Sensors and Biosensors," by Brian R. Eggins, John Wiley & Sons 2002. And handouts

Course Outline

1. Introduction (2/18)
2. Biomedical sensor architectures, types, and applications (2/25, 3/3)
3. Sensing elements (3/10, 3/17)
4. Surface treatment and immobilization (3/24)
5. Midterm Exam (3/31)
6. Semiconductor materials properties and field-effect-transistor based biosensors (4/07, 4/14, 4/21): principles, materials, devices, and applications
7. Semiconductor Schottky diode-based sensors and conductor-based sensors (4/28)
8. Electrochemical Sensors: principle, devices and applications (4/30, 5/5)
9. Piezoelectric materials-based Sensors: Principle, devices, and applications (5/12)
10. Other type sensors (5/19)
11. Lab practicing (5/26)
12. Final Exam (6/2)
13. In class Presentation (6/16)

Grading: Midterm Exam: 30%

        Final Exam: 30%

        Presentation: 30%

        Attendance & contribution: 10%

Office hours: make an appointment

For the presentation:

Each group is allowed to give a talk in 25 mins and the Q & A in 5 mins. The grade for the presentation will be assessed by the whole class. English is required for the presentation. Language fluency will not be considered in grading. Instead, whether the speech is well organized, the topic is significant, the review is in depth, the coverage of the content is adequate, and the answers for questions are satisfied, will be considered for evaluation. However, clear expression by the speaker will help the audience to learn easily which may lead to a positive evaluation.