King Fahd University of Petroleum & Minerals
College of Chemicals and Materials, Bioengineering Department
BIOE 534: Biosensors (3-0-3)
Syllabus - Term 25A

Catalog Course Description: Introduction to Sensor-Based Measurement Systems. Transducer Technologies. Resistive, Reactance Variation, and Electromagnetic Sensors. Temperature and pressure sensors. Electrochemical and chemical biosensors. Optical sensors. Signal Conditioning. Self-Generating Sensors. Digital and Intelligent Sensors. Miniaturization and Microfabrication. Biosensor Characterization. Bioanalytical Applications. Emerging Trends in Biosensors. Regulatory and Ethical Considerations. Future Directions and Challenges.

Course Prerequisite: N/A **Co-requisite:** N/A

Textbooks:

• Sensors and Signal Conditioning, 2nd Edition, by Ramón Pallás-Areny, John G. Webster, Wiley. 2007, ISBN: 978-0-470-05457-4

• Chemical Sensors and Biosensors, by Florinel-Gabriel Banica, Wiley. 2012, ISBN: 9780470710661

• Chemical Sensors An Introduction for Scientists and Engineers, by Peter Gründler, Springer, 2007

Instructor: Dr. Tanzilur Rahman / Office: Bldg.7 Room:130 / Phone: 3826 / tanzilur.rahman@kfupm.edu.sa

Office Hours: UTR 3.15 P.M.- 4:15 A.M and by appointment

Course Learning Outcomes:

- Explain the fundamentals of biosensors
- Identify a suitable biosensing concept for a given problem or scenario
- Design various biosensor systems including signal conditioning circuits
- Evaluate the performance of different biosensors
- Present a critical overview of certain biosensing modalities or techniques
- Demonstrate a high level of self-learning via documentation of previously proposed solutions for biosensors

The Grading Policy:

Attendance	**3%**
Quizzes	**12%**
Midterm	**25%**
Project Report	**10%**
Project Presentation	**15%**
Final	**35%**

Course Topics

Week#	Topic	Book and Chapter
1	Course Introduction, Introduction to Sensor-Based Measurement Systems	Sensors and Signal Conditioning 1.1 -1.6
2	Introduction to biosensors, Biosensor classification, Main elements in biosensors	Chemical Sensors and Biosensors, 1.1-1.4
2-3	Transduction Method: Sensor Physics, Sensor Chemistry	Chemical Sensors An Introduction for Scientists and Engineers 2.1 - 2.2
3-4	Project Proposal Presentation, Major 1	
4-6	Recognition Methods. Biomolecules in biosensors: DNA, enzyme, antibody, antigen, protein, peptide, aptamer	Chemical Sensors and Biosensors 2,3,6,7
Major1		
7	Carriers and Amplifiers	Chemical Sensors and Biosensors 20
8	Detection Principle and Thermal Detection	Sensors and Signal Conditioning 2,4
9	2nd Presentation,	
10	Thermal Detection(continue)	Sensors and Signal Conditioning 6
11	Resistive Sensing, ISFET based Sensing	Chemical Sensors and Biosensors 11
Major 2		
12	Electrical Impedance Measurement, Optical sensors	Chemical Sensors and Biosensors 17,18,19
13	AI in Biosensing	Multiple References including web
14	3rd Presentation	
15	Regulatory and Ethical Considerations,	Multiple References including web
16	**Final Presentation**	

Important Notes:

- The students are encouraged to use any AI tool provided they highlight the parts written by such a tool and can answer any questions about it. A proper citation for the exact name and version of the tool should be given.
- Each student must be vigilant about academic integrity at all times.
- Excused obtained from the Students Affairs Dept. are accepted. Personal excuses are not accepted.
- If a student reaches the ninth unexcused absence, it will result in a DN grade.
- For every unexcused absence, 0.5 points will be deducted from the attendance marks.
- Excuses for officially authorized absences must be presented no later than one week following the resumption of class attendance.
- Students must check the exam script within one week of publishing the score. After that, all the scores will be deemed as final and student won't be able to check their script or challenge scores anymore. Note that Final exam script checking may have even a shorter duration depending on the exam and grade submission schedule of the term.
- No makeups will be accommodated for missed quizzes or exams.
- Late assignments will not be accepted.
- A student caught cheating in any of the assignments will get 0 out of 7% in assignments and other proper action will be taken that may eventually lead to transfer the student to the student affairs.
- The instructor reserves the right to modify the course outline and policies mentioned in this syllabus at any time during the semester.