School of Engineering and Natural Sciences / Electrical and Electronics Engineering (English)

2024 - 2025 Academic Year

BIOSENSORS

Syllabus

Course Description						
Name	**Code**	**Semester**	**T+A Hour**	**Credit**	**ECTS**
BIOSENSORS	EEE4234050	Spring Semester	3+2	4	8

Prerequisites Courses	ELEKTRONİK I
Recommended Elective Courses	
Language of Instruction	English
Course Level	First Cycle (Bachelor's Degree)
Course Type	Elective
Course Coordinator	Prof.Dr. Yasemin YÜKSEL DURMAZ
Name of Lecturer(s)	Lect.Dr. Mustafa ERYÜREK
Assistant(s)	
Aim	Underlying engineering principles used to detect small molecules, DNA, proteins, and cells in the context of applications in diagnostic testing, pharmaceutical research, and environmental monitoring. Biosensor approaches including electrochemistry, fluorescence, acoustics, and optics; aspects of selective surface chemistry including methods for biomolecule attachment to transducer surfaces; characterization of bisensor performance; blood glucose detection; fluorescent DNA microarrays; label-free biochips; bead-based assay methods. Case studies and analysis of commercial biosensor.
Course Content	This course contains; Introduction to Biosensors,Biological elements,Immobilization of biological elements,Electrochemical transducers,Optical transducers,Piezoelectric transducers,Immunosensors,Figures of merit,Lab-on-a-chip biosensors,Nanobiosensors,Applications of biosensors,Application of Biosensors-II,Bendable and stretchable bioelectronics-I,Bendable and stretchable bioelectronics-II.

Course Learning Outcomes	**Teaching Methods**	**Assessment Methods**
Defines the fundamental concepts behind the operation of the most important classes of biosensors	13, 17, 19, 9	A, E
Recognize how biosensors are characterized, compared to each other, and designed to suit particular applications	13, 17, 19, 9	A, E
Evaluates how biochemical functionality is coupled to a biosensor transducer	13, 17, 19, 9	A, E
Recognizes the major applications of biosensor technology in diagnostic tests, life science research, and environmental testing	13, 17, 19, 9	A, E
Rocognizes several of the most important emerging biosensor technologies	13, 17, 19, 9	A
Gains the practice of critical thinking when considering a new detection technology and to develop the ability to communicate well-researched opinions to others	13, 17, 19, 9	A

Teaching Methods	13: Case Study Method, 17: Experimental Technique, 19: Brainstorming Technique, 9: Lecture Method
Assessment Methods	A: Traditional Written Exam, E: Homework

Lecture Schedule

Sequence	**Topics**	**Preliminary Preparation**
1	Introduction to Biosensors	Going through course materials
2	Biological elements	Going through course materials
3	Immobilization of biological elements	Going through course materials
4	Electrochemical transducers	Going through course materials
5	Optical transducers	Going through course materials
6	Piezoelectric transducers	Going through course materials
7	Immunosensors	Going through course materials
8	Figures of merit	Going through course materials
9	Lab-on-a-chip biosensors	Going through course materials
10	Nanobiosensors	Going through course materials
11	Applications of biosensors	Going through course materials
12	Application of Biosensors-II	Going through course materials
13	Bendable and stretchable bioelectronics-I	Going through course materials
14	Bendable and stretchable bioelectronics-II	Going through course materials

Evaluation Methods	**Weight(%)**
Midterm Exam	30
General Exam	70

Resources
Gennady Evtugyn, "Biosensors: Essentials", Springer, 2014Jeong-Yeol Yoon, "Introduction to Biosensors", Springer, 2016