

School of Engineering and Natural Sciences / Computer Engineering (English)

2023 - 2024 Academic Year

BIOSENSORS

Syllabus

| Course Description | | | | | |
|--|---|--------------------------------|-------------------------|---------------------------|------|
| Name | Code | Semester | T+A Hour | Credit | ECTS |
| BIOSENSORS | COE4234050 | 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 | |
| Recognizes 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 | |
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| Gennady Evtugyn, "Biosensors: Essentials", Springer, 2014Jeong-Yeol Yoon, "Introduction to Biosensors", Springer, 2016 | |