YEDİTEPE UNIVERSITY

FACULTY OF ENGINEERING

COURSE DESCRIPTION FORM

2019/2020-1

COURSE INFORMATON				
Course Code	**MSN 560**	**Course Title**	**Optical and Photonic Materials and Coatings**	
Semester	*Credits*	*ECTS*	*C +P + L Hour*	Prerequisites
3	3	10	3+0+0	-

Language of Instruction	**Course Level**	**Course Type**
English	Undergraduate	Core/Elective
Course Coordinator	Dr. Öğr. Üyesi Ayşe Dulda	
Instructors	Dr. Öğr. Üyesi Ayşe Dulda	
Assistants		
Goals	To provide a broad introduction to biological macromolecules by addressing recognition elements, biosensors and their classification. To give a general idea about the basic tools used in biophysical methods, biomolecular technology and integrated electronic signal converters. Studies on how engineering and biological approaches can be combined to solve problems in the diagnosis of diseases such as diabetes, cancer or the detection of other analytes / biomarkers, and the development of biosensors, emphasizing the integration of biological macromolecules (DNA, enzymes and antibodies).	
Content	Examples of how biosensors are used for different applications. Method verification. Protein / antibody based sensors: protein immobilization, specificity, binding constants, kinetics, diffusion. Electrochemical and optical sensors / transducers. Potentiometric methods. Redox enzymes in amperometric methods. Conductivity methods. Applications of quartz micro balance. Optical methods: UV / Vis / IR, fluorescence, luminescence, fiber optic, surface plasmon resonance. Diagnostics and other biosensor applications are discussed critically, with special emphasis on sensitivity, selectivity, and stability.	
Contribution of the Course to the Professional Education	Ability to learn how to apply course knowledge to solve real-world problems with a variety of biosensors in the medical field.	

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Course Learning Outcomes	Detailed Program Outcomes	Teaching Methods	Assessment Methods
describe how biospecific interaction is used for various applications	1a, 1b, 2a	1,2	A
describe and critically evaluate a selected application of a biosensor	1a, 1b	1,2	A, G
compare different techniques with emphasis on sensitivity and selectivity	1a, 1b	1,2	A, G
describe the most common sensor principles used today, such as electric, optical, and mechanic registration.	1a, 1b	1,2	A, G

Teaching Methods:	1: Lecture by instructor, 2: Lecture by instructor with class discussion, 3: Problem solving by instructor, 4: Use of simulations, 5: Problem solving assignment, 6: Reading assignment, 7: Laboratory work, 8: Term research paper, 9: Presentation by guest speaker, 10: Sample Project Review, 11: Interdisciplinary group working, 12: …
Assessment Methods:	A: Written exam, B: Multiple-choice exam C: Take-home quiz, D: Experiment report, E: Homework, F: Project, G: Presentation by student, H: …

COURSE CONTENT

Week	Topics	Study Materials
1	Description of Biosensors	Lecture Notes and Textbook
2	Biomolecules used in biosensors and immobilization methods.	Lecture Notes and Textbook
3	Support materials, types and properties	Lecture Notes and Textbook
4	The properties and characteristic of biosensors and performance factors	Lecture Notes and Textbook
5	Enzymatic biosensors	Lecture Notes and Textbook
6	Immunobiosensors	Lecture Notes and Textbook
7	DNA biosensors	Lecture Notes and Textbook
8	Midterm	

9	Cell based biosensors	Lecture Notes and Textbook
10	Electrochemical biosensor	Lecture Notes and Textbook
11	Optical biosensors	Lecture Notes and Textbook
12	Student Presentations	Lecture Notes and Textbook
13	Student Presentations	Lecture Notes and Textbook
14	Student Presentations	Lecture Notes and Textbook
15	Final	

RECOMMENDED SOURCES	
Textbook	A.Mulchandani, K.R. Rogers, 1998. "Enzyme and Microbial BiosensorsTechniques and Protocols", Humana Press, Totowa, New Jersey, 2- J.Cooper, T.Cass, Biosensors, 3- Biotechnology Advances 22 (2004) 505–518. Nanotechnology and Biosensors.
Additional Resources	MIT open course lecture notes

MATERIAL SHARING
Documents
Assignments
Exams

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Midterm	1	30
Presentation	1	30
Total		
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE	1	40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		

Total	**100**

COURSE CATEGORY	Field Course

COURSE'S CONTRIBUTION TO PROGRAM OUTCOMES		
No	Program Learning Outcomes	check √
1a	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline,	√
1b	Ability to use theoretical and applied knowledge in these areas in complex engineering problems.	√
2a	Ability to identify, formulate, and solve complex engineering problems,	√
2b	Ability to select and apply proper analysis and modeling methods for this purpose.	
3a	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result,	
3b	Ability to apply modern design methods for this purpose.	
4a	Ability to devise, select and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice.	
4b	Ability to employ information technologies effectively.	
5a	Ability to design experiments for investigating complex engineering problems or discipline specific research questions,	
5b	Ability to conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions.	
6a	Ability to work efficiently in intra-disciplinary teams,	
6b	Ability to work efficiently in multi-disciplinary teams,	
6c	Ability to work individually.	
7a	Ability to communicate effectively in Turkish, both orally and in writing,	
7b	Knowledge of a minimum of one foreign language,	
7c	Ability to write effective reports and comprehend written reports, prepare design and production reports,	
7d	Ability to make effective presentations,	√
7e	Ability to give and receive clear and intelligible instructions.	
8a	Recognition of the need for lifelong learning, ability to access information, ability to follow developments in science and technology,	
8b	Ability to continue to educate him/herself.	
9a	Consciousness to behave according to ethical principles and professional and ethical responsibility.	
9b	Knowledge on standards used in engineering practice.	
10a	Knowledge about business life practices such as project management, risk management, change management.	

10b	Awareness in entrepreneurship and innovation.
10c	Knowledge about sustainable development.
11a	Knowledge about the global and social effects of engineering practices on health, environment, and safety,
11b	Knowledge about contemporary issues of the century reflected into the field of engineering.
11c	Awareness of the legal consequences of engineering solutions.

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	6	84
Presentation	1	3	3
Off-the-classroom study for presentation	1	60	60
Off-the-classroom study for the final exam	1	60	60
Total Work Load			249
Total Work Load / 25 (h)			9,96
ECTS Credit of the Course			10

Prepared by: Dr. Öğr. Üyesi Ayşe Dulda	Preparation date: 15.12.2020