

**DEPARTMENT OF MOLECULAR BIOTECHNOLOGY**  
**COURSE SYLLABUS**

Course Details					
<b>Code</b>				<b>Academic Year</b>	<b>Semester</b>
MBT475				4	7
<b>Title</b>	<b>T</b>	<b>A</b>	<b>L</b>	<b>ECTS</b>	
Biosensors	3	0	2	6	
<b>Language</b>	German				
<b>Level</b>	<b>Undergraduate</b>	<b>X</b>	<b>Graduate</b>	<b>Postgraduate</b>	
<b>Department / Program</b>	Molecular Biotechnology				
<b>Forms of Teaching and Learning</b>	Face-to-face				
<b>Course Type</b>	<b>Compulsory</b>		<b>Elective</b>	<b>X</b>	
<b>Objectives</b>	The module covers the basics of biosensors, biomimetic recognition elements, molecular diagnostics, bioelectronics, biochip technology, and their applications. Students are introduced to scientific working methods and learn to design solutions.				
<b>Content</b>	The concept of biosensing and biomimetic sensors will be provided. Different detection techniques are presented, and essential combinations of biomolecules/synthetic molecules with sensors and their bioanalytical application are covered. Practical examples will be shown, and their limitations and solutions for optimization will be discussed. Biochip technology, molecular diagnostics, point-of-care testing, methods of immobilization of enzymes and proteins, and different measurement techniques (QCM, SPR, and electrochemistry) will be learned to characterize sensor functions. Focus on electrochemical biosensors.				
<b>Prerequisites</b>	-				
<b>Coordinator</b>	Assoc. Prof. Dr. Aysu Yarman				
<b>Lecturer(s)</b>	Assoc. Prof. Dr. Aysu Yarman				
<b>Assistant(s)</b>	Res. Asst. Aysel Oktay				
<b>Work Placement</b>	-				
Recommended or Required Reading					
<b>Books / Lecture Notes</b>	1. Scheller F., Schubert F. „Biosensoren“, SpringerBasel AG, 1989 2. Hall Elizabeth A.H.„Biosensoren“, Springer Verlag, 1995 3. Wollenberger U., Renneberg R., Bier F.F., Scheller F.W. „Analytische Biochemie: Eine praktische Einführung in das Messen mit Biomolekülen“, Wiley-VCH GmbH&Co. KgaA, 2003 4. Kurreck J., Engels J., Lottspeich F. (Eds) Bioanalytik, Springer Spektrum, 2021 5. Bard A. J.,Faulkner L.R. „Electrochemical Methods: Fundamentals and Applications“ , John Wiley & Sons, Inc., 2001				
<b>Other Sources</b>					
Additional Course Material					
<b>Documents</b>					

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Assignments			
Exams			
<b>Course Composition</b>			
Mathematics and Basic Sciences			%
Engineering	10		%
Engineering Design			%
Social Sciences			%
Educational Sciences			%
Natural Sciences	70		%
Health Sciences	20		%
Expert Knowledge			%
<b>Assessment</b>			
<b>Activity</b>	<b>Count</b>		<b>Percentage (%)</b>
Midterm Exam	1		40
Quiz	0		0
Assignments	0		0
Attendance	0		0
Recitations	0		0
Projects	0		0
Final Exam	1		60
		<b>Total</b>	<b>100</b>
<b>ECTS Points and Work Load</b>			
<b>Activity</b>	<b>Count</b>	<b>Duration</b>	<b>Work Load (Hours)</b>
Lectures	13	3	39
Self-Study	13	4	52
Assignments	0	0	0
Presentation / Seminar Preparation	0	0	0
Midterm Exam	1	14	14
Recitations	0	0	0
Laboratory	3	10	30
Projects	0	0	0
Final Exam	1	15	15
		<b>Total Work Load</b>	<b>150</b>
		<b>ECTS Points (Total Work Load / Hour)</b>	<b>6</b>
<b>Learning Outcomes</b>			

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<b>1</b>	Gaining knowledge of biosensors and biomimetic sensors.						
<b>Weekly Content</b>							
<b>1</b>	Introduction						
<b>2</b>	Methods of Biomolecule Immobilization						
<b>3</b>	Transducers-1 (electrochemical)						
<b>4</b>	Transducers-2 (SPR, QCM)						
<b>5</b>	Enzyme Electrochemistry-1 (Monoenzyme Electrodes)						
<b>6</b>	Enzyme Electrochemistry-2 (Coupled Enzyme Reactions in Biosensors)						
<b>7</b>	Immunosensors						
<b>8</b>	Nucleic Acid-based Sensors						
<b>9</b>	Biosensors based on Organelles, Cells and Receptors						
<b>10</b>	Biomimetic Sensors						
<b>11</b>	Examples of Applications of Biosensors-1						
<b>12</b>	Examples of Applications of Biosensors-2						
<b>13</b>	Examples of Applications of Biomimetic Sensors						
<b>Contribution of Learning Outcomes to Program Objectives (1-5)</b>							
	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>P5</b>	<b>P6</b>	<b>P7</b>
<b>1</b>	5	5	5	5	2	5	-
<b>Contribution Level:</b> 1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High							
<a href="https://obs.tau.edu.tr/oibs/bologna/progLearnOutcomes.aspx?lang=en&amp;curSunit=5707">https://obs.tau.edu.tr/oibs/bologna/progLearnOutcomes.aspx?lang=en&amp;curSunit=5707</a>							
<b>Compiled by:</b>	Assoc. Prof. Dr. Aysu Yarman						
<b>Date of Compilation:</b>	14.08.2023						