AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Biomedical Applications of Mems Nems								
Course Code	MME500		Couse Level	Second Cycle (Master's Degree)					
ECTS Credit	8	Workload	200 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course	The objective of the course is to help students learn various biomedical applications of micro/nano electromechanical systems (MEMS/NEMS).								
Course Content	Basics of MEMS/NEMS technologies, MEMS ultrasonic transducers for biomedical applications, Lab-on-chip (LOC) devices and microfluidics for biomedical applications and Applications of MEMS/NEMS technologies for minimally invasive medical procedures will be covered in this course.								
Work Placement	N/A								
Planned Learning Activities and Teaching Methods	Explanation (Presentation), Discussion, Problem Solving								
Name of Lecturer(s)	Assoc. Prof. Adem ÖZÇELİK								

Assessment Methods and Criteria		
Method	Quantity	Percentage (%)
Midterm Examination	1	20
Final Examination	1	50
Assignment	3	10
Project	1	20

Recommended or Required Reading	
1	1. Albert Folch, Introduction to BioMEMS, CRC Press, 2013
2	2. Marc J. Madou, From MEMS to Bio-MEMS and Bio-NEMS: Manufacturing Techniques and Applications, 3rd Edition, CRC Press, 2011.
3	3. Steven Saliterman, Fundamentals of BioMEMS and medical microdevices, Wiley Interscience, 2006.

Week	Weekly Detailed Course Contents	
1	Theoretical	Basics of MEMS/NEMS technologies
2	Theoretical	Substrate and cell patterning
3	Theoretical	Microfluidics Fundamentals
4	Theoretical	Micromixers
5	Theoretical	Hydrogel microdevices and microstructures
6	Theoretical	Softlithography and its biomedical applications
7	Theoretical	Molecular biology on-chip: Point of care diagnostics, problems with microfluidic sample preparation
8	Intermediate Exam	Midterm Exam
9	Theoretical	Cell based chips for biotechnology: Cell sorting, cell trapping, microfluidic cell culture laboratories.
10	Theoretical	BioMEMS/NEMS for biology: cell-cell communication , developmental biology on-chip
11	Theoretical	Tissue microengineering
12	Theoretical	Implantable micro devices
13	Theoretical	Applications of MEMS/NEMS technologies for minimally invasive medical procedures
14	Theoretical	Cellular microinjection for therapeutic and research applications
15	Theoretical	MEMS/NEMS based biosensors
16	Final Exam	Final Exam

Workload Calculation				
Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	5	3	112
Assignment	3	6	0	18
Term Project	1	20	10	30
Midterm Examination	1	16	2	18

Final Examination	1	20	2	22
			Total Workload (Hours)	200
			[Total Workload (Hours) / 25*] = **ECTS**	8
**25 hour workload is accepted as 1 ECTS*				

Learning Outcomes	
1	1. To be able to understand basic principles of MEMS/NEMS devices
2	2. To be able to understand the in-vitro and in-vivo cell and tissue applications using MEMS/NEMS
3	3. To be able to select suitable MEMS/NEMS technologies for a given biomedical application
4	4. To be able to apply principles and capabilities of MEMS/NEMS technologies to biomedical problems and have strong research skill.
5	5. To be able to conduct literature search and present on a given topic.

Programme Outcomes *(Mechanical Engineering (English) Master)*	
1	To be able to access wide and deep information with scientific researches in the field of Engineering, evaluate, interpret and implement the knowledge gained in his/her field of study
2	To be able to complete and implement “limited or incomplete data” by using the scientific methods
3	To be able to consolidate engineering problems, develop proper method(s) to solve and apply the innovative solutions to them
4	To be able to develop new and original ideas and method(s), to develop new innovative solutions at design of system, component or process
5	To be able to gain comprehensive information on modern techniques, methods and their borders which are being applied to engineering
6	To be able to design and apply analytical, modeling and experimental based research, analyze and interpret the faced complex issues during the design and apply process
7	To be able to gain high level ability to define the required information and data
8	To be able to work in multi-disciplinary teams and to take responsibility to define approaches for complex situations
9	To be able to transfer of the process and results of studies at national and international environments systematic and clear verbal or written
10	To be able to be aware of social, scientific and ethical values guarding adequacy at all professional activities and at the stage of data collection, interpretation, and announcement
11	To be able to become aware of new and developing application of profession and ability to analyze and study on those applications
12	To be able to interpret engineering application’s social and environmental dimensions and it’s compliance with the social environment

Contribution of Learning Outcomes to Programme Outcomes *1:Very Low, 2:Low, 3:Medium, 4:High, 5:Very High*

	L1	L2	L3	L4	L5
P1	5	5	5	4	4
P2	5	4	4	5	5
P3	4	5	5	4	5
P4	4	4	4	5	4
P5	5	3	4	4	5
P6	5	5	4	5	4
P7	4	4	5	5	5
P8	4	5	4	4	4
P9	5	4	3	3	3
P10	5	5	5	5	5
P11	4	4	5	5	4
P12	5	5	4	4	5