MSc program, Biomedical Engineering Department

Course Unit Title	Advance Artificial Organs
Course Unit Code	BME512
Type of Course Unit	Elective
Level of Course Unit	Master of Science
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	10
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof. Dr. Nesrin Hasırcı
Name of Lecturer (s)	Prof. Dr. Nesrin Hasırcı / Assoc. Prof. Dr. Terin Adalı
Name of Assistant (s)	-
Mode of Delivery	Face to Face.
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	-

Course description:

Medical devices that replace the function of one of the major organs in the body must usually interface with flowing blood. Examples include total artificial hearts, left ventricular assist devices, membrane oxygenators, haemodialysis systems and encapsulated endocrine cells. The design of these devices relies on integration of knowledge from a variety of fields, in particular computational fluid dynamics and blood rheology. We will study the process by which a concept for a device eventually leads to a functioning, blood-contacting medical device. An introduction to computational fluid dynamics (the finite difference and finite volume methods) will be integrated with computer-aided design and testing of devices using the software package Fluent.

Objectives of the Course:

- Important artificial organs and their design, properties and applications
- Importance of research on these areas.

Learning Outcomes;

At the end of the course the student should be able to;

- Design and understand artifical organs
- How to apply Tissue engineering principles to artifical organs
- Understand which material is suitable fort the specific design.

	Assessment

1	Explain phenomena taking place between biomaterials (implants) and surrounding tissue in living organisms.	1
2	Know process of degration of biomaterials and transport processes in synthetic membranes in artificial organs	1, 2
3	Make synthetic review of literature on new trends in biomaterials implants and artificial organs	1, 2
4	Know principles of artificial organs and their functions	1, 2

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	Apply the rules of scientific research and ethics	5
2	Discuss complex biomedical engineering issues as well as own research results comprehensively and in the context of current international research and present these in writing and orally	4
3	Solve problems by systems analytical thinking both in subject specific and interdisciplinary concepts	4
4	Combine specialized knowledge of various component disciplines	3
5	Carry out in dependent scientific work and organize (capacity of teamwork), Conduct and lead more complex projects	4
6	To assess the social and environment-related effects of their actions	3

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Assessment
1		Introduction	
2		Research Planning	
3		Tissue material interaction	
4		Extracorporeal devices	
5		Hemodialysis-Hemoperfusion	

6		Oxygenators	
7		Review/Exam	
8		Heart valves	
9		Artificial Total Heart	
10		Artificial Cochlea	
11		Artificial Nose	
12		Artificial Eye	
13		Review	
14			Final Exam.

Recommended Sources

Textbook: Lecture notes and research papers

Assessment

Project	15%	
Midterm Exam	30%	Written Exam
Final Exam	50%	Written Exam
Attendance	5%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

1. Attendance to the course is mandatory.
2. Late assignments will not be accepted unless an agreement is reached with the lecturer.
3. Students may use calculators during the exam.
4. Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload			
Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	15	4	60
Labs and Tutorials	10	10	100
Assignment	-	-	-
Project/Presentation/Report	3	10	30
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	6	6
Final Examination	1	12	12
Self Study	15	7	105
Total Workload			313
Total Workload/30(h)			104
ECTS Credit of the Course			10