Course Unit Title	Biomedical Sensors
Course Unit Code	BME301
Type of Course Unit	Compulsory
Level of Course Unit	3rd year BSc program
National Credits	4
Number of ECTS Credits Allocated	6
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	3
Semester when the course unit is delivered	5
Course Coordinator	Ali Işın
Name of Lecturer (s)	Ali Işın
Name of Assistant (s)	Niyazi Şentürk
Mode of Delivery	Face to Face.
Language of Instruction	English
Prerequisites	EE208 Basic Electronics)
Recommended Optional Programme Components	

Course description:

The basis of biosensor design, analysis and selection of physical, optical, electrical, mechanical, thermal transduction mechanisms. The properties of transducers, dynamic linearity, hysteresis and frequency range. Biological elements, immobilization of biological components. Medical, biological and chemical sensors and transducers based on electrochemistry, optics, and solid-state devices.

Objectives of the Course:

- Introducing first, second and higher order differential equations, and the methods of solving these equations.
- Emphasizing the important of differential equations and its engineering application.
- Introducing the Laplace transform and its applications in solving differential equations and other engineering applications.
- Introducing the series method in solving differential equations.

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	Develop a thorough understanding on basics of biomedical sensors and biomedical transducers	1
2	Develop a thorough understanding on basics of data acquisition	1, 2
3	Develop a thorough understanding on basics of sensor characteristics and sensor design.	1, 2
4	Identify the different types of biopotential sensors.	1, 2
5	Identify the different types of resistive, reactance variation and selfgenerating sensors.	1,2,3
6	Identify the different types of optical sensors	1,2,3
7	Discuss the operating principle, calibration, parameters and applications of all types of biomedical sensors.	1,2,3,4

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

Course's Contribution to Program

		CL
1	Apply knowledge of mathematics, natural science with relevant to life science and multidisciplinary context of engineering science.	5
2	Analyze, design and conduct experiments, as well as to analyze and interpret data.	4
3	Design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.	
4	Function on multidisciplinary teams.	3
5	Control in design work, by using simulation, modelling and tests and integration in a problem solving oriented way.	4
6	Display an understanding of professional and ethical responsibility.	2
7	Communicate effectively aware of the non-technical effects of engineering.	1
8	Search technical literature and other information sources.	2
9	Recognize of the need for, and an ability to engage in life-long learning.	3
10	Exhibit a knowledge of contemporary issues.	2
11	Use the techniques, skills and modern engineering tools necessary for engineering practice to develop marketable products for the global market.	4

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

Course Contents

Week	Chapter	Topics	Assessment
1		Introduction	
2		Cardiac Pacemakers	
3		Implantable Defibrillators	
4		Blood Pumbs	
5		Measurement of Flow and Volume of Blood	
6		Photoplethysmogram	
7		Therapeutic and Prosthetic Devices	
8			Midterm
9		Clinical Laboratory Instrumentaion	
10		Intensive Care and Coronary Care Units	
11		Electrosurgical Devices	
12		Implantable Stimulators for Neuromuscular Control	
13		EMG & EEG Systems	
14		Revision Week	
15			Final Exam.

Recommended Sources

Textbook:

20. J.J. Carr, J.M. Brown: Introduction to Biomedical Equipment Technology, Prentice Hall, 2nd Ed. 2001.

21 J.G Webster: Medical Instrumentation: Application and design, Wiley, 2010.

Assessment

Attendance	5%	
Lab	20%	
Midterm Exam	30%	Written Exam
Final Exam	45%	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	-	-	-
Assignment	11	2	22
Project/Presentation/Report	-	-	-
E-learning activities	5	2	10
Quizzes	-	-	-
Midterm Examination	1	2	2
Final Examination	1	2	2
Self Study	15	4	60
Total Workload			156
Total Workload/30(h)			5.52
ECTS Credit of the Course			6