MSc Program, Biomedical Engineering Department

Course Unit Title	Advance Biomedical Signal-Image Processing
Course Unit Code	BME507
Type of Course Unit	Elective
Level of Course Unit	Master of Science Level
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Assist. Prof. Dr. Boran Şekeroğlu
Name of Lecturer (s)	Assist. Prof. Dr.Boran Şekeroğlu
Name of Assistant (s)	-
Mode of Delivery	Face to Face.
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	-

Course description:

This course is designed for biomedical engineering master students. The purpose of the course is to provide biomedical signal and image processing background on technical aspects. Fundamentals of digital signal-image processing, signal-image conditioning, frequency analysis, digital filtering methods, feature extraction methods, classification methods and applications on EEG – ECG signals and CT-MRI images are introduced in detail. Students are provided with overviews of the major techniques that engineers have used to explore in biomedical engineering level.

Objectives of the Course:

To provide the students with an understanding of critical evaluation of scientific literature and scientific and engineering research and development in this field, as well as the skills required to present and support their findings.

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	Develop a thorough understanding on basics of digital signals and biological signals.	1

2	Develop a thorough understanding on basics of medical images	1
3	Develop a thorough understanding on basics of signal pre-processing and digital filtering.	1,2
4	Develop a thorough understanding on basics of image pre-processing and image filtering.	1,2
5	Develop a thorough understanding on basics of feature extraction methods	1,2
6	Develop a thorough understanding on basics of pattern recognition and classification algorithms.	1,2
5	Learning and using MATLAB Software to apply digital filters and other digital processing methods to biomedical signals and medical images	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 the rules of scientific research and ethics	4
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	5
4	Combine specialized knowledge of various component disciplines	5
5	Carry out in dependent scientific work and organize (capacity of teamwork), Conduct and lead more complex projects	5
6	To assess the social and environment-related effects of their actions	4

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

Course Contents

Week	Chapter	Topics	Assessment
1		Introduction to digital and biological signals	
2		Introduction to medical images	
3		Signal Conditioning: Mean , Correlation and Ensemble Averaging	

4		Median Filtering, Moving Average Filtering and Principal Component Analysis	
5		Digital Filtering: Filtering in frequency domain	
6		Digital Filtering: Filtering in time domain	
7		Mid Term Exam	Mid Term Exam
8		- Introduction to ECG and EEG Signals -Event Detection - QRS Detection -Biological Signal Feature Extraction - Classification methodologies for biological signals	
9		Digital Image Fundamentals	
10		Image Enhancement in the spatial domain	
11		Image Enhancement in the frequency domain	
12		Image Restoration- Morphological Image Processing	
13		Image Segmentation	
14		Object Recognition	
15		Final Exam	Final Exam

Recommended Sources

Textbook:

1. Rafael C. Gonzalez – Richard E. Woods. Digital Image Processing.Second Edition. 2002. Prentice Hall. ISBN 0-13-094650-8.
2. Sanjit K. Mitra. Digital Signal Processing: A Computer Based Approach. Second Edition. 2002. Mc Graw Hill. ISBN 0-07-122607-9

Lecture Notes

Assessment

Project	30%	
Midterm Exam	30%	Written Exam
Final Exam	40%	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)	16	4 h	64
Labs and Tutorials	10	10	100
Assignment	4	3	12
Project/Presentation/Report	3	10	30
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	5	5
Final Examination	1	3	3
Self Study	-	100	100
Total Workload			320
Total Workload/30(h)			10.2
ECTS Credit of the Course			10