MSc program, Biomedical Engineering Department

Course Unit Title	Pattern Recognition
Course Unit Code	BME532
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. Purpose of this course is to provide pattern recognition and classification techniques. Different event detection, feature extraction and classification methods 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 equip students, with advance mathematical and statistical techniques commonly used in pattern recognition.
- To introduce students a variety of pattern recognition algorithms, along with pointers on which algorithms work best under various conditions.
- To prepare students real World problems evaluation and solution.
- To provide a detailed overview of some advanced topics in pattern recognition and a projectopportunity to conduct independent, cutting-edge and published research.

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	Develop a thorough understanding on basic event/feature detection	1, 2, 3

	techniques.	
2	Develop a thorough understanding on principles of different feature extraction techniques.	1, 2, 3
3	Develop a thorough understanding on principles of different classification methods.	1, 2, 3

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	5
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	5

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

Course Contents

Week	Chapter	Topics	Assessment
1		Introduction to Pattern Recognition, Feature Detection, Classification	
2		Review of Probability Theory, Conditional Probability and Bayes Rules	
3		Random Vectors, Expectation, Correlation, Covariance	
4		Decision Theory, ROC Curves, Likelihood Ratio Test	
5		Linear and Quadratic Discriminants, Fisher Discriminant	
6		Template-based Recognition, Feature Extraction	

7		Eigenvector and Multilinear Analyses	
8		Midterm	Midterm Exam
9		Training Methods, Maximum Likelihood and Bayesian Parameter Estimation	
10		Support Vector Machines	
11		K-Nearest-Neighbor Classification	
12		Unsupervised Learning, Clustering, Vector Quantization, K-means	
13		Decision Trees, Multi-layer	
14		perceptron's & Review week	
15		Final Exam	Final Exam

Recommended Sources:

Lecture Notes.

Assessment

Attendance	5%	Less than 25% class attendance results in NA grade
Project	15%	
Midterm Exam	30%	Written Exam
Final Exam	50%	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)			10.4
ECTS Credit of the Course			10