BOĞAZİÇİ UNIVERSITY

Institute of Biomedical Engineering

SYLLABUS

Mathematics for Biomedical Engineering Course

Fall Semester

Course Code	Course Name	Course Type	Weekly Hours T	A	L	Credits	ECTS	Campus / Weekly Time & Classroom Schedule
BM 503	Basic Mathematics for Biomedical Science	Elective	3	1	0	4	9	To be arranged.
Prerequisite		Prerequisite to						

Course Lecturers	Ahmet Ademoğlu	Office Hours Schedule	
E-mail	ademoglu@boun.edu.tr		
Phone	0216 516 3447	Office / Room No	A1-05
Teaching Assistant	Hüden Neşe	Phone	0216 516 3447
E-mail	hudennese@gmail.com	Office / Room No	A1-05

Course Objectives	Covering the fundamental mathematical background for machine learning. Studying matrix calculus and probability theory to understand the mathematical foundations of estimation, optimization and machine learning algorithms.

Textbooks/ References	1	*Pattern Recognition and Machine Learning,* C. M. Bishop, Springer, 2006.
		https://www.microsoft.com/en-us/research/people/cmbishop/prml-book/
	2	*Bayesian Reasoning and Machine Learning* , D. Barber, Cambridge, 2012.
		http://www.cs.ucl.ac.uk/staff/d.barber/brml/
	3	*Mathematics for Machine Learning,* M. P. Desienroth, A. A. Faisal & C. S. Ong, Cambridge, 2019.
		https://course.ccs.neu.edu/ds4420sp20/readings/mml-book.pdf
Learning Outcomes	1	Linear Algebra & Matrix Calculus
	2	Probability Calculus and Multivariate Random Distributions
	3	Estimation and Optimization
	4	Expectation Maximization and Variational Bayes Algorithms
	5	Hidden Markov Models
Teaching Methods		Lecturing, assignments and tutorials.

WEEK	Subject studied for that week	Resources
Week 1	Matrix Algebra	Text 3
Week 2	Matrix Calculus	Text 3
Week 3	Basic Axioms of Probability Theory	Text 1, 2 and 3
Week 4	Conditional Probability	Text 1, 2 and 3
Week 5	Random Variables	Text 1, 2 and 3
Week 6	Multivariate Distributions	Text 1, 2 and 3
Week 7	Midterm I	
Week 8	Estimation	Text 1, 2
Week 9	Monte Carlo Methods	Text 1, 2
Week 10	Expectation Maximization Algorithm	Text 1, 2
Week 11	Variational Bayes Algorithm	Text 1, 2
Week 12		
Week 13	Hidden Markov Models	Text 1, 2
Week 14	Hidden Markov Models	
Week 15	Final Exam	

Assessment Methods and Criteria	Evaluation Tool	Quantity	Date	Weight in %
	Final Exam	1		30
	Semester Evaluation			70
	Attendance, active tutorials	1		10
	In-term exams	2		25
	Homework Assignments	7		35

*** ECTS Credit Calculation ***

Language of Instruction: English

Evaluation Tool	Hour	Quantity	Student Workload Hours	Evaluation Tool	Hour	Quantity	Student Workload Hours
Theoretical hours	3	13,0	39	In Term Exam	10	2	20,0
Preclass self study	4	13,0	52	Final Exam	20	1	20,0
Postclass self study	4	13,0	52	Assignments	5	6	30,0

GENERAL TOTAL HOURS:	213,0
Recommended ECTS Credit (Total Hours / 25) :	9