ABDULLAH GÜL UNIVERSITY
GRADUATE SCHOOL OF ENGINEERING & SCIENCE
ELECTRICAL AND COMPUTER ENGINEERING PROGRAM
COURSE DESCRIPTION AND SYLLABUS

Course Title	Code	Semester	T+L Hours	Credit	ECTS
Neural Engineering	ECE-640	FALL-SPRING	3 + 0	3	10

Prerequisite Courses	N/A

Type	Selective
Language	English
Coordinator	Prof. Bülent Yılmaz
Instructor	Prof. Bülent Yılmaz
Adjunt	none
Aim	To understand the anatomical and physiological fundamentals of brain and neural systems, to explain important neural diseases, and describe existing methods and technologies used in diagnosis and treatment of these diseases and propose novel designs.
Learning Outcomes	• The skill to explain the organization and working mechanisms of the brain, neural system and neurons. • The skill to describe the neuro-electrophysiological concepts and formation of neural membrane potentials, to model the action potentials on the neurons. • The skill to understand the propagation of action potentials and the synaptic transmission. • The skill to explain the fundamental principles and neural diseases of vision and audition and to list the technologies used in the treatment of these diseases. • The skill to compare the anatomical and functional neuroimaging approaches. • The skill to list the most frequent brain and neural system diseases and to compare the technologies used in the treatment of these diseases.
Course Content	• Fundamentals of neuroanatomy • Basic neuroelectrophysiology • Modeling of electrical activity on neural membranes (action potential) • Action potential propagation on a neuron and between neurons • Eye, vision and related diseases, technologies used in diagnosis and treatment of neural diseases of this organ • Ear, audition and related diseases, technologies used in diagnosis and treatment of neural diseases on this organ • Anatomical and functional imaging of brain and neural system • Technologies used in the diagnosis and treatment of brain and neural system

WEEKLY TOPICS AND PRELIMINARY STUDY

Week	Topic	Preliminary Study
1	Motivation of the course and basics of neuroanatomy	The relevant articles from the literature
2	Basic neuroelectrophysiology	The relevant articles from the literature
3	Basic neuroelectrophysiology	The relevant articles from the literature
4	Formation of action potentials on neurons	The relevant articles from the literature
5	Modeling of neural action potentials	The relevant articles from the literature
6	Propagation of action potentials and synaptic transmission of electrical impulse	The relevant articles from the literature
7	Channels and transporters active in synaptic transmission (Midterm Exam I)	The relevant articles from the literature
8	Anatomy of the eye and vision physiology	The relevant articles from the literature
9	Neural problems in vision and technologies used in diagnosis and treatment of these problems	The relevant articles from the literature
10	Anatomy of the ear and auditory physiology	The relevant articles from

		the literature
11	Neural problems in auditory system and technologies used in diagnosis and treatment of these problems (Midterm Exam II)	The relevant articles from the literature
12	Neuroimaging techniques I	The relevant articles from the literature
13	Neuroimaging techniques II	The relevant articles from the literature
14	Common neural diseases, techniques used in the diagnosis and treatment of these diseases	The relevant articles from the literature
15	Paper presentations	The relevant articles from the literature
16	Final Exam	

SOURCES	
Lecture Notes	Lecture slides
Other Sources	**Additional Materials:** 1. The Human Brain Book, Rita Carter, Susan Aldridge, Martyn Page, Steve Parker

COURSE MATERIALS SHARING	
Documents	Lecture notes and slides
Homeworks	Students will be given one homework every two weeks
Exams	2 Midterm and 1 Final Exams

EVALUATION SYSTEM		
SEMESTER STUDY	**NUMBER**	**CONTRIBUTION**
Midterm	2	30
Homework	5	20
Presentations	2	10
Quiz	5	15
SUB-TOTAL		75
Contribution of Semester Study		75
Contribution of Final Exam	1	25
TOTAL		100

Course Category	
Sciences and Mathematics	60%
Engineering	40%
Social Sciences	0%

RELATIONSHIPS BETWEEN LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS							
No	Program Qualifications	Contribution Level					
		1	2	3	4	5	
1	Ability to use math, science and engineering knowledge in advanced research				x		
2	Ability to design, realize and analyze a novel system to solve engineering problems			x			
3	To be able to use modern measurement equipment, hardware and software for expertise area research			x			
4	Ability to plan and do detailed independent research				x		
5	Ability to do literature search, technical presentation, and prepare scientific manuscript					x	
6	Be able to do critical and creative thinking and finding innovative methods					x	

*Increasing from 1 to 5.

ECTS / WORK LOAD TABLE			
Activities	Number	Duration (Hours)	Total Work Load
Course Length (includes exam weeks: 16x total course hours)	16	3	48
Out-of-class Study Time (Pre-study, practice)	16	5	80
Internet search, library work, literature search	16	4	64
Presentation	2	15	30
Homework	4	10	40
Midterm	2	10	20
Final Exam	1	20	20
Total Work Load			302
Total Work Load / 30			302/30
Course ECTS Credit			10