COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
Medical Acoustic and Speech Processing	BME 565	1	0 + 0	3	10

Prerequisites	-

Language of Instruction	English
Course Level	Master's Degree
Course Type	Technical Elective
Course Coordinator	Prof. Ali Ümit Keskin
Instructors	Prof. Dr. Ali Ümit KESKIN
Assistants	-
Goals	Introduce methods of Medical Acoustic and Speech Processing in Biomedical Engineering
Content	Heart sounds, lung sounds, pathological heart and lung sounds, Ear, nose and throat, digital models for the speech signal. Time domain models for speech and sound processing. Digital representations. Short time Fourier analysis. Sub Band coding. Transform coding. Linear predictive coding. Homomorphic speech and sound processing. Delayed decision coding. Performance measurement in digital processing systems. Digital signal processors.

Learning Outcomes	**Program Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Adequate knowledge in numerical solutions of problems	2,3,5,10	1,2,3,9	A,C
2) Ability to perform numerical analysis using the basic laws and rules.	1,4	1,2,3,9	A,C
3) Development of practical skills in computational design and application of various techniques in Biomedical Engineering.	1,2,3,4,8,9	1,2,3	A,C

Teaching Methods:	1: Lecture, 2: Question-Answer, 3: Discussion, 9: Simulation, 12: Case Study
Assessment Methods:	A: Testing, B: Experiment, C: Homework, D: Project

COURSE CONTENT		
Week	**Topics**	**Study Materials**
1	Bio-acoustics and diagnostics	Textbook
2	Mathematical Models	Textbook
3	Numerical models for acoustic signals	Textbook
4	Lung based normal and pathological signals	Textbook
5	Ear,throat and nose models	Textbook
6	Heart sounds	Textbook
7	MIDTERM I	-
8	Time domain models	Textbook
9	Short time Fourier Analysis	Textbook
10	Sub-band coding	Textbook
11	Transform coding	Textbook
12	Homomorphic speech and sound processing	Textbook
13	Performance measurement in digital processing systems	Textbook
14	Applications in medical diagnostics	Textbook

RECOMMENDED SOURCES	
Textbook	Jens Blauert, Ning Xiang Acoustics for Engineers: Troy Lectures, Springer Science & Business Media, 2009
Additional Resources	AU Keskin, Electrical Circuits in Biomedical Engineering,Springer,2017

MATERIAL SHARING	
Documents	-
Assignments	-
Exams	-

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-terms	1	25
Assignment	10	75

Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		**100**

COURSE CATEGORY	Expertise/Field Courses

COURSE'S CONTRIBUTION TO PROGRAM

No	Program Learning Outcomes	Contribution				
		1	2	3	4	5
1	Ability to reach wide and deep knowledge through scientific research in the field of Biomedical Engineering, evaluate, interpret and apply.					**X**
2	Ability to use scientific methods to cover and apply limited or missing knowledge, and to integrate the knowledge of different disciplines to identify, define, formulate solutions to complex engineering problems.				**X**	
3	Ability to construct Biomedical Engineering problems, develop methods to solve the problems and use innovative methods in the solution.				**X**	
4	Ability to develop new and/or original ideas, tools and algorithms; develop innovative solutions in the design of system, component or process.					**X**
5	Ability to have extensive knowledge about current techniques and methods applied in Biomedical Engineering and their constraints.				**X**	
6	Ability to design and implement analytical modeling and experimental research, solve and interpret complex situations encountered in the process.				**X**	
7	Ability to use a foreign language (English) at least at the level of European Language Portfolio B2 in verbal and written communication.					
8	Ability to lead in multidisciplinary teams, develop solutions to complex situations and take responsibility.				**X**	
9	Ability to pass process and the results in Biomedical Engineering field, in national and international area in or outside of the field, systematically and clearly in written or oral form.				**X**	
10	Awareness of the social, legal, ethical and moral values and environmental dimensions. The ability to conduct research and implementation work within the framework of these values.				**X**	
11	Awareness of the new and emerging applications in Biomedical Engineering field, and the ability to examine them and learn if necessary.					
12	Ability to read, understand, present, critise research work and conduct original theoretical or applied research.					

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Including the exam week: 14x Total course hours)	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	3	42
Mid-terms	1	14	14
Homework	10	2	20
Final examination	1	14	14
Total Work Load			132
Total Work Load / 25 (h)			5.58
ECTS Credit of the Course			10