



## AYDIN ADNAN MENDERES UNIVERSITY COURSE INFORMATION FORM

Course Title		Automatic Speech Recognition and Synthesis							
Course Code		MTK639		Couese Level		Third Cycle (Doctorate Degree)			
ECTS Credit	7.5	Workload	189 ( <i>Hours</i> )	Theory	3	Practice	0	Laboratory	0
Objectives of the Course		In this course, the subjects of Speech Recognition and Synthesis will be taught and the applications about the course will be developed. Firstly, speech production and acoustic modeling will be presented. Then, The methods of Speech Recognition and Synthesis will be explained.							
Course Content		Acoustic Theory of Speech Production, Human hearing, acoustics, and phonetics. Signal Representation, Vector Quantization. Speech spectrum analysis (Fourier analysis, cepstral analysis, spectrogram reading). Fundamental frequency analysis (F0 estimation, prosody models). Speech synthesis. Linear Prediction (all-pole model, LPC, PARCOR, LSP analysis). Learning algorithms and application (Viterbi algorithm, Bayes' Theorem). Speech coding (waveform coding, PCM, LPC). Dynamic time warping and acoustic modeling. Hidden Markov Modeling, expectation-maximization, and search. Language Modeling. Graphical Models. Segment-Based ASR, Finite State Transducers.							
Work Placement		N/A							
Planned Learning Activities and Teaching Methods				Explanation (Presentation), Discussion, Individual Study, Problem Solving					
Name of Lecturer(s)									

### Assessment Methods and Criteria

Method	Quantity	Percentage (%)
Midterm Examination	1	25
Final Examination	1	50
Assignment	1	25

### Recommended or Required Reading

1	Fundamentals of Speech Recognition, Rabiner and Juang, Prentice-Hall, 1993
2	An Introduction to Text-to-Speech Synthesis, Thierry Dutoit, Kluwer Academic Publishers, Dordrecht Hardbound, ISBN 0-7923-4498-7, 1997

Week	Weekly Detailed Course Contents	
1	Theoretical	Acoustic Theory of Speech Production, Human hearing, acoustics, and phonetics
	Preparation Work	Read the related subjects from the Course Books
2	Theoretical	Signal Representation, Vector Quantization
	Preparation Work	Read the related subjects from the Course Books
3	Theoretical	Speech spectrum analysis (Fourier analysis, cepstral analysis, spectrogram reading)
	Preparation Work	Read the related subjects from the Course Books
4	Theoretical	Fundamental frequency analysis (F0 estimation, prosody models)
	Preparation Work	Read the related subjects from the Course Books
5	Theoretical	Speech synthesis
	Preparation Work	Read the related subjects from the Course Books
6	Theoretical	Linear Prediction (all-pole model, LPC, PARCOR, LSP analysis)
	Preparation Work	Read the related subjects from the Course Books
7	Theoretical	Learning algorithms and application (Viterbi algorithm, Bayes' Theorem)
	Preparation Work	Read the related subjects from the Course Books
8	Theoretical	Speech coding (waveform coding, PCM, LPC)
	Preparation Work	Read the related subjects from the Course Books
9	Preparation Work	Read all subjects again
	Intermediate Exam	Midterm exam
10	Theoretical	Dynamic time warping and acoustic modeling
11	Theoretical	Hidden Markov Modeling, expectation-maximization, and search
	Preparation Work	Read the related subjects from the Course Books
12	Theoretical	Language Modeling
	Preparation Work	Read the related subjects from the Course Books



13	Theoretical	Graphical Models
	Preparation Work	Read the related subjects from the Course Books
14	Theoretical	Segment-Based ASR, Finite State Transducers
	Preparation Work	Read the related subjects from the Course Books
15	Preparation Work	Read all subjects again
	Final Exam	Final exam

**Workload Calculation**

Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	3	3	84
Assignment	1	0	21	21
Midterm Examination	1	35	2	37
Final Examination	1	45	2	47
Total Workload (Hours)				189
[Total Workload (Hours) / 25*] = ECTS				7.5

\*25 hour workload is accepted as 1 ECTS

**Learning Outcomes**

1	Ability to understand the concepts of Speech Recognition and Synthesis
2	Ability to use the methods of Speech Recognition and Synthesis
3	Ability to develop the applications about Speech Recognition and Synthesis
4	To be able to gain the skill of interpreting some interrelations among these concepts
5	To be able to use mathematical concepts in solving certain types of problems

**Programme Outcomes (Mathematics Doctorate)**

1	To be able to develop the current and advanced knowledge of mathematics domain to expertise level by an original idea or research, based on the level of its knowledge at the graduate level, and to be able to reach original definitions that will bring innovation to Mathematics.
2	To be able to comprehend the interdisciplinary interaction associated with Mathematics.
3	To be able to use and evaluate the new knowledge in the field of Mathematics with a systematic approach.
4	To be able to develop an idea, a method, a design or an application that will bring innovation to Mathematics, to use well known ideas, methods, designs or applications on a different research area, or to search, comprehend, design, adapt and apply an original subject matter.
5	To be able to criticize, analyze, synthesize and evaluate new and complex ideas.
6	To be able have high-level skills in research methods related to studies on Mathematics.
7	To be able to expand the frontiers knowledge in the field of Mathematics via generating or interpreting an original study, or publishing at least a scientific paper in national/international refereed journals.
8	To be capable of leadership in the positions that require the analyses of problems related to the field of Mathematics.
9	To be able to defend his/her original ideas among the experts in the discussion of math related issues, and to be able to communicate effectively to show his/her competence in the field of Mathematics.
10	To be able to contribute to the solution of the social, scientific, cultural and ethical problems related to the Mathematics, and to be able to support the development of social, scientific, cultural and ethical values.
11	To be able to have both oral and written communication using a foreign language.

**Contribution of Learning Outcomes to Programme Outcomes** 1:Very Low, 2:Low, 3:Medium, 4:High, 5:Very High

	L1	L2	L3	L4	L5
P1	4	4	4	4	4
P2	3	5	5	5	5
P3	4	4	5	5	5
P4	4	5	5	5	4
P5	4	4	5	5	5
P6	4	5	5	5	5
P7		3	4	4	4
P9	4	4	4	4	4
P10	4	4	5	5	5
P11	4	4	4	4	4

