AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Advanced Neural Networks								
Course Code	MTK638		Couse Level		Third Cycle (Doctorate Degree)				
ECTS Credit	7.5	Workload	189 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course	Artificial neural networks (ANNs) as the subjects of artificial intelligence are widely used in computer science. ANNs are very advantageous in most systems, especially in the systems which have very complex mathematical structures. In this course, the aim is to teach ANN subjects in detail and to develop advanced ANN applications.								
Course Content	Introduction to Artificial Intelligence and Machine Learning. Introduction to Artificial Neural Networks (ANNs). The basic structures of ANNs. Elementary Artificial Neural Networks. Supervised learning. Multilayer Perceptron. Reinforcement learning. Learning Vector Quantization (LVQ). Unsupervised learning. Adaptive Resonance Theory (ART). Recurrent Neural Networks and other networks. Hybrid ANN Models. Neural Network Hardware. Applications of ANN.								
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	Foundations of Neural Networks, T. Khana, Addison-Wesley Publishing Comp., 1990
2	Yapay Sinir Ağları, Prof. Dr. Ercan Öztemel, Papatya Yayıncılık, 2003

Week	Weekly Detailed Course Contents	
1	Theoretical	Introduction to Artificial Intelligence and Machine Learning
	Preparation Work	Read the related subjects from the Course Books
2	Theoretical	Introduction to Artificial Neural Networks (ANNs)
	Preparation Work	Read the related subjects from the Course Books
3	Theoretical	The basic structures of ANNs
	Preparation Work	Read the related subjects from the Course Books
4	Theoretical	Elementary Artificial Neural Networks
	Preparation Work	Read the related subjects from the Course Books
5	Theoretical	Supervised learning. Multilayer Perceptron
	Preparation Work	Read the related subjects from the Course Books
6	Theoretical	Reinforcement learning. Learning Vector Quantization (LVQ)
	Preparation Work	Read the related subjects from the Course Books
7	Theoretical	Unsupervised learning. Adaptive Resonance Theory (ART)
	Preparation Work	Read the related subjects from the Course Books
8	Theoretical	Recurrent Neural Networks and other networks
	Preparation Work	Read the related subjects from the Course Books
9	Preparation Work	Read all subjects again
	Intermediate Exam	Midterm exam
10	Theoretical	Recurrent Neural Networks and other networks
	Preparation Work	Read the related subjects from the Course Books
11	Theoretical	Hybrid ANN Models
	Preparation Work	Read the related subjects from the Course Books
12	Theoretical	Neural Network Hardware
	Preparation Work	Read the related subjects from the Course Books

13	Theoretical	Applications of ANN
	Preparation Work	Read the related subjects from the Course Books
14	Theoretical	Applications of ANN
	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 artificial neural network (ANN) concepts
2	Ability to design ANN methods which use supervised, unsupervised and reinforcement learning approaches
3	Ability to develop advanced applications using ANN
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	3	5	5	4	4
P2	3	4	5	5	5
P3	3	5	5	4	4
P4	4	5	5	4	4
P5		3	5	5	5
P7			3	3	
P9	4	4	5	4	4
P10		3	4	4	3
P11	3	4	4	3	4