COURSE INFORMATION					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
Deep Learning	**CSE588**	**1**	**3**	**3**	**10**

Prerequisites	The students are advised to take "CSE 585 Machine Learning" or "CSE 562 Artificial Intelligence" courses.

Language of Instruction	English
Course Level	Graduate
Course Type	Elective
Course Coordinator	
Instructors	Assist.Prof.Dr. Dionysis Goularas Prof.Dr. Emin Erkan Korkmaz
Assistants	
Goals	The aim of this course is to provide students the knowledege about the basic techniques and methodologies of Deep Learning and abilities to apply Deep Learning methods on practical problems.
Content	Applied Mathematics for Deep Learning, Machine Learning Basics, Deep Feedforward Networks, Regularization for Deep Learning, Convolutional Neural Networds, Recurrent Neural Networks, LSTM, Autoencoders, Structured Probabilistic Models, Deep Generative Models, Boltzman Machines.

Course Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Knowledge about the basic methodologies in deep learning.	3	1,2	A,C,D
2) Ability to use knowledge to formulate, and solve practical problems using deep learning techniques.	2	1,2,4	A,C

Teaching Methods:	1: Lecture, 2: Question-Answer, 3: Lab, 4: Case-study
Assessment Methods:	A: Testing, B: Experiment, C: Homework, D: Project

COURSE CONTENT		
Week	**Topics**	**Study Materials**
1	Introduction	Textbook
2	Applied Mathematics for Deep Learning	Textbook
3	Machine Learning Basics	Textbook
4	Deep Feedforward Networks, Regularization for Deep Learning	Textbook
5	Autoencoders	Textbook
6	Convolutional Neural Networks	Textbook
7	Deep Learning Applications: Image Processing with CNNs	Textbook
8	Recurrent Neural Nets and LSTMs	Textbook
9	Deep Learning Applications: Natural Language Processing with LSTMs	Textbook
10	Midterm	Textbook
11	Structured Probabilistic Models for Deep Learning	Textbook
12	Deep Generative Models: Bolztman Machines	Textbook
13	Deep Reinforcement Learning	Textbook
14	Project presentations	Textbook

RECOMMENDED SOURCES	
Textbook	Deep Learning,MIT Press, By Ian Goodfellow and Yoshua Bengio and Aaron Courville (2016)
Additional Resources	Hands-On Machine Learning with Scikit-Learn and TensorFlow, O'Reilly Media, By Aurélien Géron (2017)
MATERIAL SHARING	
Documents	
Assignments	
Exams	

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Assignment	1	10
Project	1	50
Midterm	1	40
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 Computer Science and 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.					
3	Ability to construct Computer Science and 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 and algorithm; 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 Computer 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.					
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.					
9	Ability to pass process and the results in Computer Science and Engineering field, in national and international area in or outside of the field, systematically and clearly in written or oral form.					
10	Awareness of the social, legal, ethical and moral values, and the ability to conduct research and implementation work within the framework of these values.					
11	Awareness of the new and emerging applications in Computer Science and Engineering field, and the ability to examine them and learn if necessary.					
12	Ability to describe the social and environmental dimensions of Computer Science and Engineering applications.					

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration	14	3	42

Hours for off-the-classroom study (Pre-study, practice)	14	6	84
Project	1	80	80
Assignment	1	30	30
Midterm Examination	1	3	3
Final examination	1	3	3
Total Work Load			242
Total Work Load / 25 (h)			9.68
ECTS Credit of the Course			10