

Faculty	Faculty of Engineering		
Program	B.Sc. in Civil Engineering	Elective	
	B.Sc. in Computer Engineering	Elective	
	B.Sc. in Electrical-Electronics Engineering	Elective	
	B.Sc. in Industrial Engineering	Elective	
	B.Sc. in Mechanical Engineering	Elective	
Semester	Fall 2016-2017		

Course Code	COMP 460			
Course Title in English	Introduction to Machine Learning			
Course Title in Turkish	Yapay Öğrenmeye Giriş			
Language of Instruction	English			
Type of Course	Flipped Classroom			
Level of Course	Undergraduate			
Course Category (by % of Content)	Basic Science	Basic Engineering	Engineering Design	General Education
	10	70	20	-
Semester Offered	Fall			
Contact Hours per Week	Lecture: 3 hours	Recitation: -	Lab:-	Other:-
Estimated Student Workload	160 hours per semester			
Number of Credits	5 ECTS			
Grading Mode	Standard Letter Grade			
Pre-requisites	None			
Expected Prior Knowledge	Prior knowledge in programming and, and in general fundamentals of probability and statistics is expected.			
Co-requisites	None			
Registration Restrictions	Only Undergraduate Students			
Overall Educational Objective	To learn fundamentals of machine learning methods and how to design and implement intelligent systems to make prediction, classification, and regression.			
Course Description	This course covers the fundamentals of machine learning approaches: Supervised learning, unsupervised learning, regression methods, outlier detection, feature analysis, validation and evaluation.			
Course Description in Turkish	Bu ders yapay öğrenmede kullanılan temel yöntemleri içermektedir: Gözetimli ve gözetimsiz öğrenme, bağlantım yöntemleri, aykırılık tespiti, öznitelik analizi, geçерleme ve performans değerlendirmesi			
Course Learning Outcomes and Competences	Upon successful completion of the course, the learner is expected to:			
	<ol style="list-style-type: none"> 1. Apply classification methods to recognize patterns 2. Apply regression methods to estimate trends 3. Assess the performance of machine learning methods 			

4. Design and construct a machine learning system for a given task/problem

Relation to Student Outcomes and Competences: N=None S=Supportive H=Highly Related

Relationship of the Course with the Student Outcomes and Competences	Level	Assessed by
	N/S/H (Related Learning Outcomes and Activities)	Exam, Project, HW, Lab, Presentation, etc.
(a) an ability to apply knowledge of mathematics, science, and engineering.	H (1,2,3,4)	Exams, Assignments
(b) an ability to design and conduct experiments, as well as to analyze and interpret data.		
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.		
(d) an ability to function on multidisciplinary teams.		
(e) an ability to identify, formulate, and solve engineering problems.	H (1,2,3,4)	Exams, Assignments
(f) an understanding of professional and ethical responsibility.		
(g) an ability to communicate effectively.	S	Assignment Presentations
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.		
(i) a recognition of the need for, and an ability to engage in life-long learning.		
(j) a knowledge of contemporary issues.	S	Assignments
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.		

Prepared by and Date Asst. Prof. Dr. Berk Gökberk / January 2017

Name of Instructor Asst. Prof. Dr. Berk Gökberk

Course Contents	Week	Topic
	1.	Introduction to Machine Learning Concepts
	2.	Supervised Classification: Naïve Bayes
	3.	Supervised Classification: Support Vector Machines
	4.	Supervised Classification: Decision Trees
	5.	Regression
	6.	Outlier Analysis
	7.	Unsupervised Learning: K-means Clustering
	8.	Feature Analysis: Feature Selection
	9.	Feature Analysis: Feature Extraction
	10.	Performance Evaluation: Training, Test, Validation Data
	11.	Artificial Neural Networks: Single Layer Neural Networks
	12.	Artificial Neural Networks: Multilayer Neural Networks
	13.	Linear Classification
	14.	Nonlinear Classification

	15.	Final Examination Period.
	16.	Final Examination Period.
Required/Recommended Readings	Introduction to Machine Learning, Ethem Alpaydın, MIT Press, 3rd Edition (2015)	
Teaching Methods	Flipped Classroom	
Homework and Projects	Assignments	
Laboratory Work	-	
Computer Use	Required	
Other Activities	-	
Assessment Methods	Types of assessment:	
		Number Ratio (%)
	Midterm Exams	1 30
	Assignments	4 30 (each contributing 7.5%)
	Final Exam	1 40
Course Administration	<p>Instructor's office and phone number: MEF 5th Floor office hours: TBA email address: gokberkb@mef.edu.tr Rules for attendance: Minimum of 70% attendance required. Missing a midterm: Provided that proper documents of excuse are presented, each missed midterm by the student will be given the grade of the final exam. No make-up will be given. Missing a final: Faculty regulations. A reminder of proper classroom behavior, code of student conduct: YÖK Regulations Statement on plagiarism: YÖK Regulations http://3fcampus.mef.edu.tr/uploads/cms/webadmin.mef.edu.tr/4833_2.pdf</p>	

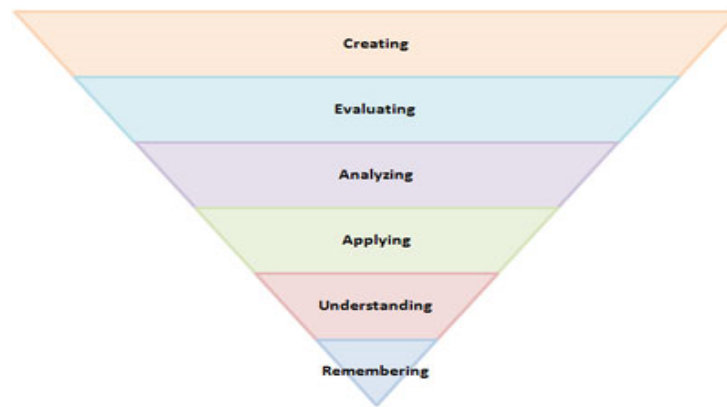
ECTS Student Workload Estimation	Activity	Weeks	Hours			Calculation	Explanation
		Weeks per Semes	Hours for the Activity (B)	Hours the Activity Itself	Hours for the Activity Require		
	Lecture	14	2	2	2	84	*(B+C+D)
	Quizzes						A*(B+C+D)
	Assignments	4	1	4	1	24	*(B+C+D)
	Midterm(s)	1	8	3		11	*(B+C+D)
	Final Examination	1	12	2		14	*(B+C+D)
	Total Workload					133	
	Workload/semes					5,32	
	ECTS					5	

PROGRAM CRITERIA

1. Breadth in computer engineering practice, analysis and design with 17 required course, and depth in one or more fields with 11 electives.
2. Knowledge of mathematics, including differential and integral calculus, basic sciences, computer science, and engineering sciences that is necessary for analysis and design of complex electrical and electronic devices, software, and systems containing hardware and software components.
3. Knowledge of probability and statistics, including application to computer engineering; knowledge of advanced mathematics, including differential equations, linear algebra, complex variables, and discrete mathematics

Key verbs for cognitive domain in writing learning outcomes and competences:

Bloom's Taxonomy



Revised edition by Lorin Anderson (a student of Bloom)

Key Verbs:

Remembering: defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.

Understanding: comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.

Applying: applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.

Analyzing: analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.

Evaluating: appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports.

Creating: categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes.

Key verbs for affective domain in writing learning outcomes and competences:

Receiving Phenomena: asks, chooses, describes, follows, gives, holds, identifies, locates, names, points to, selects, sits, erects, replies, uses.

Responding to Phenomena: answers, assists, aids, complies, conforms, discusses, greets, helps, labels, performs, practices, presents, reads, recites, reports, selects, tells, writes.

Valuing: completes, demonstrates, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, shares, studies, works.

Organizing: adheres, alters, arranges, combines, compares, completes, defends, explains, formulates, generalizes, identifies, integrates, modifies, orders, organizes, prepares, relates, synthesizes.

Internalizing values: acts, discriminates, displays, influences, listens, modifies, performs, practices, proposes, qualifies, questions, revises, serves, solves, verifies.