



COURSE INFORMATION FORM

Course Name	Course Code
APPLIED MACHINE LEARNING	151413563

Semester	Number of Course Hours per Week		ECTS
	Theory	Practice	
3	3	0	3

Course Category (Credit)				
Basic Sciences	Engineering Sciences	Design	General Education	Social
1	2			

Course Language	Course Level	Course Type
Turkish	Undergraduate	Compulsory

<b>Prerequisite(s) if any</b>	-
<b>Objectives of the Course</b>	The aim of the course is to enable students to learn the fundamental concepts and algorithms of machine learning, apply this knowledge to practical applications, and develop machine learning solutions for real-world problems encountered in various disciplines, particularly in civil engineering. The course also aims to provide students with skills in data analysis, modeling, programming, and problem-solving, offering them a competitive advantage in their careers and academic development.
<b>Short Course Content</b>	This course covers the fundamental concepts and algorithms of machine learning. The content includes classification (logistic regression and support vector machines), clustering (K-means, K-nearest neighbors, and hierarchical clustering), and data preprocessing techniques. Additionally, model evaluation and improvement methods are taught through practical examples using machine learning libraries in R or Python.

Learning Outcomes of the Course	Contributed PO(s)	Teaching Methods *	Measuring Methods **
1 Learning the fundamentals of machine learning	1,2,3,4,5,8	1,6,11	A,D,J
2 Understanding data processing and cleaning methods	1,2,3,4,5	1,6,11,12,15	A,D,J
3 Ability to model and analyze	1,2,3,4,5,8	1,6,11,12,15	A,D,J
4 Model evaluation and improvement	1,2,3,4,5	1,6,11,12,15	A,D,J
5 Ability to use programming languages and libraries	1,2,3,4,5,6,8,10	1,6,11,12,15	A,D,J
6 Gaining project management, teamwork, and presentation skills	6,7,8,9,10,11	2,12,13,14,15	A,D,J
7			
8			

\*Teaching Methods 1:Expression, 2:Discussion, 3:Experiment, 4:Simulation, 5:Question-Answer, 6:Tutorial, 7:Observation, 8:Case Study, 9:Technical Visit, 10:Trouble/Problem Solving, 11:Individual Work, 12:Team/Group Work, 13:Brain Storm, 14:Project Design / Management, 15:Report Preparation and/or Presentation

\*\*Measuring Methods A:Exam, B:Quiz, C:Oral Exam, D:Homework, E:Report, F:Article Examination, G:Presentation, I:Experimental Skill, J:Project Observation, K:Class Attendance; L:Jury Exam

<b>Main Textbook</b>	Lecture notes
<b>Supporting References</b>	Alpaydın E. (2014). Introduction to Machine Learning, Boğaziçi University, Publisher: The MIT Press, (Third Edition). Mitchell T. (2016). Machine Learning, Publisher: McGraw Hill, 1997 (First Edition). Guttag, J. Introduction to Computation and Programming Using Python: With Application to Understanding Data. 2nd ed. MIT Press. Grimson E., Guttag J., Bell A. (2016). Introduction To Computational Thinking And Data Science. MIT OpenCourseWare. Ben-Akiva, M., Lerman, S. (1985). Discrete Choice Analysis, The MIT Press. Hensher, D.A., Rose, J.M., Greene, W.H. (2005). Applied Choice Analysis: A Primer, Cambridge University Press.
<b>Necessary Course Material</b>	Laptop or desktop computer, presentation/projector device, fixed/movable presentation screen, whiteboard.

<b>Course Schedule</b>	
<b>1</b>	Introduction to the course and R programming language
<b>2</b>	Introduction to machine learning
<b>3</b>	Data collection and cleaning
<b>4</b>	Data exploration, processing, and sampling
<b>5</b>	K-means clustering analysis
<b>6</b>	K-nearest neighbors clustering analysis
<b>7</b>	Hierarchical clustering analysis
<b>8</b>	Mid-Term Exam
<b>9</b>	Introduction to utility theory and logistic regression analysis
<b>10</b>	Deterministic and stochastic choice approaches
<b>11</b>	Binary and multinomial logistic regression analysis
<b>12</b>	Interpretation of model parameters
<b>13</b>	Support vector machines
<b>14</b>	Evaluation of model performance
<b>15</b>	Selection of the optimal model
<b>16,17</b>	Final Exam

<b>Calculation of Course Workload</b>			
<b>Activities</b>	<b>Number</b>	<b>Time (Hour)</b>	<b>Total Workload (Hour)</b>
Course Time (number of course hours per week)	14	3	42
Classroom Studying Time (review, reinforcing, prestudy,...)	14	1	14
Homework	0	0	0
Quiz Exam	0	0	0
Studying for Quiz Exam	0	0	0
Oral exam	0	0	0
Studying for Oral Exam	0	0	0
Report (Preparation and presentation time included)	1	2	2
Project (Preparation and presentation time included)	0	0	0
Presentation (Preparation time included)	1	2	2
Mid-Term Exam	1	14	14
Studying for Mid-Term Exam	1	1	1
Final Exam	1	14	14
Studying for Final Exam	1	1	1
<b>Total workload</b>			<b>90</b>
<b>Total workload / 30</b>			<b>3</b>
<b>Course ECTS Credit</b>			<b>3</b>

Evaluation	
<b>Activity Type</b>	<b>%</b>
Mid-term	30
Quiz	30
<b>Final Exam</b>	40
<b>Total</b>	100

RELATIONSHIP BETWEEN THE COURSE LEARNING OUTCOMES AND THE PROGRAM OUTCOMES (PO) (5: Very high, 4: High, 3: Middle, 2: Low, 1: Very low)		
NO	PROGRAM OUTCOME	Contribution
1	Sufficient knowledge of engineering subjects related with mathematics, science and own branch; ability to apply theoretical and practical knowledge on solving and modeling of engineering problems.	4
2	Ability to determine, define, formulate and solve complex engineering problems; for that purpose an ability to select and use convenient analytical and experimental methods.	5
3	Ability to design a complex system under real life constrains or conditions, defined by environmental, economical and political problems; for that purpose an ability to apply modern design methods.	4
4	Ability to develop, select and use modern methods and tools required for engineering applications; ability to effective use of information technologies.	5
5	In order to investigate engineering problems; ability to set up and conduct experiments and ability to analyze and interpretation of experimental results.	4
6	Ability to work effectively in inner or multi-disciplinary teams; proficiency of interdependence.	4
7	Ability to communicate in written and oral forms in Turkish/English; proficiency at least one foreign language.	1
8	Awareness of life-long learning; ability to reach information; follow developments in science and technology and continuous self-improvement.	4
9	Understanding of professional and ethical issues and taking responsibility	1
10	Awareness of project, risk and change management; awareness of entrepreneurship, innovativeness and sustainable development.	2
11	Knowledge of actual problems and effects of engineering applications on health, environment and security in global and social scale; an awareness of juridical results of engineering solutions.	1

LECTUTER(S)				
<b>Prepared by</b>	Dr. Kadir Berkhan AKALIN			
<b>Signature(s)</b>				

**Date:**12/07/2024