<table>
<tr><th colspan="2">COURSE DESCRIPTION FORM</th></tr>
<tr><td>Course Code and Name</td><td>CENG373 INTRODUCTION TO MACHINE LEARNING (TECH.ELECT.)</td></tr>
<tr><td>Course Semester</td><td>5</td></tr>
<tr><td>Catalogue Data of the Course (Course Content)</td><td>Fundamentals of machine learning, supervised and unsupervised learning, regression, optimization, linear classification, perceptron, support vector machines, artificial neural networks, convolutional neural networks, recurrent neural networks, performance measures, ensemble classifier, clustering algorithms</td></tr>
<tr><td>Course Textbooks</td><td>Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, The MIT Press, 2016.

Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education.</td></tr>
<tr><td>Supplementary Textbooks</td><td>Michael B. White, “Machine Learning: A Journey from Beginner to Advanced Including Deep Learning, Scikit-learn and Tensorflow Paperback”, CreateSpace Independent Publishing Platform, 2018.</td></tr>
<tr><td>Credit (ECTS)</td><td>6</td></tr>
<tr><td>Prerequisites for the Course (Attendance Requirements)</td><td>-</td></tr>
<tr><td>Course Type</td><td>Technical Elective</td></tr>
<tr><td>Language of Instruction</td><td>English</td></tr>
<tr><td>Course Objectives</td><td>To provide fundamental knowledge on machine learning and applying machine learning models to real world problems.</td></tr>
<tr><td>Course Learning Outcomes</td><td>1. Learning the basic concepts of machine learning.
2. Understanding the concepts of supervised and unsupervised learning.
3. Applying principal machine learning algorithms such as regression and support vector machines.
4. Having knowledge and experience about non-linear machine learning models and their applications.
5. Understanding clustering models.</td></tr>
<tr><td>Instruction Method
(Face-to-face, Distance education etc.)</td><td>The mode of delivery of this course is face to face.</td></tr>
<tr><td>Weekly Schedule of the Course</td><td>1.Week: Introduction to machine learning
2.Week: Machine learning applications, data types
3.Week: Machine learning concepts
4.Week: Regression and Optimization
5.Week: Linear Classification and Perceptron
6.Week: Support Vector Machines
7.Week: Artificial Neural Networks
8.Week: Artificial Neural Networks training and backpropagation
9.Week: Convolutional Neural Networks
10.Week: Convolutional Neural Networks
11.Week: Recurrent Neural Networks
12.Week: Classification performance measures and ensemble classifiers
13.Week: Partition and density-based clustering
14.Week: Hierarchical clustering</td></tr>
<tr><td>Teaching Activities
(The time spent for the activities listed here will determine the amount of credit required)</td><td>Weekly theoretical course hours
Internet search and library work
Designing and implementing materials
Making a report
Preparing and making presentations
Midterm and revision for midterm
Final exam and revision for final exam</td></tr>
<tr><td>Assessment Criteria</td><td>
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<tr><th></th><th>Number(s)</th><th>Weight (%)</th></tr>
<tr><td>Midterm exam</td><td>1</td><td>30</td></tr>
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Assignment			
Application			
Project	1	30	
Practice			
Quiz			
Final exam	1	40	
Total	3	100	

Workload of the Course

Activity	Number of Weeks	Duration (Weekly Hour)	End of Semester Total Workload
Weekly theoretical course hours	14	3	42
Weekly practical course hours	0	0	0
Reading activities	0	0	0
Internet search and library work	10	5	50
Designing and implementing materials	5	5	25
Making a report	1	8	8
Preparing and making presentations	1	5	5
Midterm and revision for midterm	1	10	10
Final exam and revision for final exam	1	10	10
Total workload			150
Total workload/ 25			6
Course Credit (ECTS)			6

Contribution Level between Course Outcomes and Program Outcomes

No	Program Outcomes	1	2	3	4	5
1	Knowledge of mathematics, science, basic engineering, computing, and computer engineering; ability to use this knowledge in solving complex engineering problems.					x
2	Ability to define, formulate and analyze complex engineering problems using basic science, mathematics and engineering knowledge and considering the UN Sustainable Development Goals relevant to the problems addressed.					x
3	Ability to design creative solutions to complex engineering problems; ability to design complex systems, processes, devices, software, algorithms or products to meet current and future requirements, considering realistic constraints and conditions.			x		
4	Ability to select, use and develop appropriate techniques, resources and modern engineering and informatics tools, including estimation and modeling, for the analysis and solution of complex engineering problems while being aware of their limitations.				x	
5	Ability to use research methods to examine complex engineering problems or research topics in computer engineering, including reviewing the literature, designing experiments, conducting experiments, collecting data, analyzing and interpreting results.					x
6	Knowledge of the effects of engineering practices and the standards used in these practices on society, health and safety, economy, sustainability and environment within the scope of the UN Sustainable Development Goals; awareness of the					

	consequences of engineering solutions in the fields of information security and law.						
7	Acting in accordance with engineering professional principles and knowledge on ethical responsibility; awareness of acting impartially, without discrimination on any issue, and being inclusive of diversity.						
8	Ability to work effectively individually and as a team member or leader in intradisciplinary and multidisciplinary teams (face-to-face, remote, or hybrid).						x
9	Ability to conduct effective verbal and written communication on technical issues in Turkish or English, prepare reports, make effective presentations and prepare software documentation, considering the various differences of the target audience (such as education, language, profession).						x
10	Knowledge of business practices such as project, risk and change management and economic feasibility analysis; awareness of entrepreneurship and innovation.				x		
11	Lifelong learning skill that includes the ability to learn independently and continuously, to adapt to new and developing scientific practices and technologies, and to think inquisitively about technological changes.						x

Lecturer(s) and Contact Information	Assist. Prof. Dr. Ceren Güzel Turhan cerenguzel@gazi.edu.tr