

 OSTİM TEKNİK ÜNİVERSİTESİ A N K A R A	FACULTY OF ENGINEERING COURSE SYLLABUS FORM	Doküman No	MF.FR.003
		Revizyon Tarihi	13.11.2024
		Revizyon No	01
		Sayfa No	1 / 4

SENG 455- MACHINE LEARNING				
Course Code	Course Name			Semester
SENG 455	Machine Learning			Fall ☒ Spring ☐ Summer ☐
Hours			Credit	ECTS
Theory	Practice	Lab	3	5
3	0	0		

Course Details	
Department	Software Engineering
Course Language	English
Course Level	Undergraduate ☒ Graduate ☐
Mode of Delivery	Face to Face ☒ Online ☐ Hybrid ☐
Course Type	Compulsory ☐ Elective ☒
Course Objectives	The aim of this course is to ensure that students understand the fundamental concepts, algorithms, and application processes of machine learning. The course will cover basic machine learning algorithms such as linear regression, classification, clustering, decision trees, support vector machines, and k-nearest neighbors, both theoretically and practically. By the end of the course, students are expected to: - Select appropriate algorithms for given problems, - Successfully apply them on various datasets, - Learn concepts related to model evaluation and performance metrics, - Optimize model performance, - Conduct analyses with real-life projects and sample datasets. The course also aims to help students grasp the role of machine learning in engineering, informatics, and data science, as well as its impact on problem-solving processes.

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Course Content	1. Basic concepts and historical development of machine learning 2. Supervised and unsupervised learning algorithms 3. Linear and logistic regression 4. K-nearest neighbor algorithm 5. Support vector machines 6. Decision trees and random forests 7. Clustering methods (K-means, hierarchical clustering) 8. Dimensionality reduction methods (PCA, LDA) 9. Model evaluation and performance metrics (accuracy, F1 score, ROC curve) 10. Overfitting and validation strategies (cross-validation)
Course Method/ Techniques	Lecture ☒ Question & Answer ☒ Presentation ☒ Discussion ☒
Prerequisites/ Corequisites	Data Mining
Work Placement(s)	
Textbook/References/Materials	
- Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Mathematics for Machine Learning, Cambridge University Press, 2020 - Tom M. Mitchell, Machine Learning, McGraw Hill Education - Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media, 2nd Edition	

Course Category				
Mathematics and Basic Sciences	☒		Education	☐
Engineering	☒		Science	☐
Engineering Design	☒		Health	☐
Social Sciences	☐		Profession	☐

Weekly Schedule		
No	Topics	Materials/Notes
1	Basic concepts and historical development of machine learning	Overview of concepts, types, and applications
2	Supervised Learning	Introduction to supervised learning, labeled data, classification, regression; model evaluation metrics
3	Linear and Logistic Regression	Use in prediction and classification
4	Cost Function & Gradient Descent	Minimization of model error

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5	Non-linear Algorithms	Decision trees, KNN, SVM
6	K-Nearest Neighbors (KNN)	Principles and applications
7	Support Vector Machines & Naive Bayes	Principles, advantages, use cases
8	Midterm Exam	
9	Tree-Based Methods	Decision trees, random forests, gradient boosting
10	Tree-Based Methods (cont'd)	Practical applications
11	Ensemble Learning	Bagging, boosting, stacking
12	Unsupervised Learning	Clustering, dimensionality reduction
13	Clustering Algorithms	K-means, hierarchical clustering, DBSCAN
14	Dimensionality Reduction	
15	General Review	
16	Final Project	

Assessment Methods and Criteria		
In-term studies	Quantity	Percentage
Attendance		
Lab		
Practice		
Fieldwork		
Course-specific internship		
Quiz/Studio/Criticize		
Homework		
Presentation / Seminar	1	10
Project	1	50
Report	1	15
Seminar		
Midterm Exam	1	25
Final Exam		
Total		100%
Contribution of Midterm Studies to Success Grade		
Contribution of End of Semester Studies to Success Grade		
Total		100%

ECTS Allocated Based on Student Workload			
Activities	Quantity	Duration (Hrs)	Total Workload
Course Hours (Including Exam week)	16	3	48
Lab			
Practice			
Fieldwork			
Course-specific Work Placement			
Out-of-class study time	16	2	32
Quiz/Studio/Criticize			
Homework			

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Presentation / Seminar	1	5	5
Project	1	20	20
Report	1	5	5
Midterm Exam and Preparation for Midterm	1	15	15
Final Exam and Preparation for Final Exam			
Total Workload			125
Total Workload / 25			5
ECTS Credit			5

Course Learning Outcomes	
No	Outcome
L1	An ability to understand the fundamental concepts and techniques of machine learning
L2	Understand supervised learning and apply classification/regression.
L3	Explain linear and logistic regression techniques.
L4	Recognize non-linear algorithms such as decision trees, KNN, and SVM.
L5	Evaluate data partitioning, flexibility, and accuracy in tree-based methods.

Contribution of Course Learning Outcomes to Program Competencies/Outcomes												
Contribution Level: 1: Very Slight, 2: Slight, 3: Moderate, 4: Significant, 5: Very Significant												
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	Total
L1	4			4						3	4	15
L2	4	4										8
L3		3			5							8
L4				4	5	4						13
L5					5							5
Total												49