

School of Engineering and Natural Sciences / Industrial Engineering (English)

2022 - 2023 Academic Year

DATA SCIENCE

Syllabus

Course Description					
Name	Code	Semester	T+A Hour	Credit	ECTS
DATA SCIENCE	IND4111487	Fall Semester	3+0	3	6
Prerequisites Courses	OLASILIK VE RASSAL DEĞİŞKENLER				
Recommended Elective Courses	Machine Learning, Deep Learning, Artificial Neural Network, Algorithm Analysis				
Language of Instruction	English				
Course Level	First Cycle (Bachelor's Degree)				
Course Type	Elective				
Course Coordinator	Prof.Dr. Reda ALHAJJ				
Name of Lecturer(s)	Prof.Dr. Reda ALHAJJ				
Assistant(s)					
Aim	This course introduces the basics of data science as the rapidly emerging most popular domain for researchers and practitioners in the 21st century. It highlights the basic skills to be acquired by a data scientist with various applications from medicine, homeland security, engineering, finance, etc. The objectives of the course are (1) introducing the concept of knowledge discovery in data and discuss the steps to be followed including the problem definition, data collection, integration and management, data analysis, and visualization. (2) highlighting the importance of dealing with various aspects of data, including volume, variety, velocity, veracity, value, etc., (3) introducing the basic statistical and machine learning techniques which could be effectively used for knowledge discovery, (4) covering network modeling and graph analysis as powerful alternative mechanisms for making sense from data, (5) illustrating how data visualize is effective for communication, and (6) covering basics of recommendation systems.				
Course Content	This course contains; Introduction to Data Science, probability, statistics, linear algebra,Basic data models, Entity-Relationship model, Relational Model and SQL.,From SQL to NoSQL, non-relational databases and related data models, XML Model and Xquery. ,NoSQL Databases, the case of Mongo DB. ,Sources and types of big data, frequent pattern analysis. ,Presentations by students research articles / tools. ,Presentations by students research articles / tools. ,Midterm,Clustering,Classification, Incremental data analysis and Scalable methods for Data management and analysis. ,Network model and graph analysis. ,Data visualization,Recommendation systems.				
Course Learning Outcomes			Teaching Methods	Assessment Methods	
Understanding of basic network modeling and graph analysis techniques to handle data science tasks.			1, 16	A, C, D, E	
1. Understanding the basics of data science and the skill sets distinguishing a data scientist.			1, 16	A, C, D, E	
2. Understanding the basics of data collection, modeling and management for data science tasks.			1, 16	A, C, D, E	
3. Understanding of basic statistical modeling and analysis for data science tasks.			1, 16	A, C, D, E	
4. Understanding basic machine learning algorithms and techniques needed to cope with data science tasks.			1, 16	A, C, D, E	
4. Understanding basic machine learning algorithms and techniques needed to cope with data science tasks.			1, 16	A, C, D, E	
6. Understanding of basic approaches to visualize data for effective communication and understanding.			1, 16	A, C, D, E	
Teaching Methods	1: Lecture, 16: Project Based Learning				
Assessment Methods	A: Written Exam, C: Homework, D: Project / Design, E: Quiz				
Lecture Schedule					
Sequence	Topics	Preliminary Preparation			
1	Introduction to Data Science, probability, statistics, linear algebra	Lecture Notes, Week 1.			
2	Basic data models, Entity-Relationship model, Relational Model and SQL.	Lecture Notes, Week 2.			
3	From SQL to NoSQL, non-relational databases and related data models, XML Model and Xquery.	Lecture Notes, Week 3.			
4	NoSQL Databases, the case of Mongo DB.	Lecture Notes, Week 4.			
5	Sources and types of big data, frequent pattern analysis.	Lecture Notes, Week 5.			
6	Presentations by students research articles / tools.	Literature survey.			
7	Presentations by students research articles / tools.	Literature survey.			
8	Midterm	All the topics till Week 8.			
9	Clustering	Lecture Notes, Week 9.			
10	Classification	Lecture Notes, Week 10.			
11	Incremental data analysis and Scalable methods for Data management and analysis.	Lecture Notes, Week 11.			
12	Network model and graph analysis.	Lecture Notes, Week 12.			
13	Data visualization	Lecture Notes, Week 13.			
14	Recommendation systems	Lecture Notes, Week 14			
Evaluation Methods		Weight(%)			
Midterm Exam		30			
General Exam		70			

Resources
No specific text book, notes will be made available, including in class notes, (sometimes) slides, research papers, book chapters, etc.