

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

**2022 - 2023 Academic Year**

**ADVANCED PROGRAMMING**

**Syllabus**

<b>Course Description</b>					
<b>Name</b>	<b>Code</b>	<b>Semester</b>	<b>T+A Hour</b>	<b>Credit</b>	<b>ECTS</b>
ADVANCED PROGRAMMING	IND1212508	Spring Semester	3+2	4	5
<b>Prerequisites Courses</b>	PROGRAMLAMAYA GİRİŞ				
<b>Recommended Elective Courses</b>					
<b>Language of Instruction</b>	English				
<b>Course Level</b>	First Cycle (Bachelor's Degree)				
<b>Course Type</b>	Required				
<b>Course Coordinator</b>	Prof.Dr. Selim AKYOKUŞ				
<b>Name of Lecturer(s)</b>	Prof.Dr. Selim AKYOKUŞ				
<b>Assistant(s)</b>					
<b>Aim</b>	The objective of this course is to improve programming and problem solving capabilities and skills of students using Python with an emphasis on programming practice, efficiency and data science. Python is widely used language in education, scientific computing and data science with a large number of libraries. Students will learn, design, develop and test efficient programs that take advantage of built-in libraries developed for AI and data science without having to know about complex logic and mathematics behind them. Topics include programming efficiency and analysis, study and analysis of some basic algorithms, graphical user interfaces, advanced features of Python, Python Data Structures, Loading Datasets from Different Data Stores, Array-Oriented Programming with NumPy, High-Performance NumPy Arrays, Pandas Series and DataFrames, Regular Expressions and Data Wrangling, Time Series and Simple Linear Regression, Natural Language Processing (NLP), Web Scraping, Data Mining Twitter: Sentiment Analysis, Machine Learning: Classification, Regression and Clustering, Deep Learning Convolutional and Recurrent Neural Networks, Recommendations with Collaborative Filtering, Optimization.				
<b>Course Content</b>	This course contains; Developing Efficient Algorithms, Analysis of Searching and Sorting Algorithms, Python Data Structures, Data Analysis and Visualization, Array-Oriented and Scientific Programming with NumPy and SciPy, Data Manipulation with Pandas, Data Loading, Storage, and File Formats; Data Visualization, Time Series and Simple Linear Regression, Natural Language Processing (NLP), Web Scraping, Data Mining Twitter: Sentiment Analysis, JSON and Web Services, Machine Learning: Classification, Regression and Clustering, Deep Learning Convolutional and Recurrent Neural Networks, Collaborative Filtering, Making Recommendations, Optimization.				
<b>Course Learning Outcomes</b>		<b>Teaching Methods</b>		<b>Assessment Methods</b>	
Design, implement and test efficient programs.					
Improve programming skills by learning, analyzing, solving and developing program code for different problems.					
Learn how to design, develop and implement modular programs by using structured programming, abstract data types, classes and objects.					
Take advantage of capabilities of built-in and third party libraries available in many areas.					
Learn how to store, load, manipulate and explore data.					
Summarize, visualize and analyze data.					
Write programs for a wide variety of problems in math, science, engineering, financials, artificial intelligence and games.					
Learn how to use and apply some of the machine learning, data mining, and optimization libraries on several examples.					
<b>Teaching Methods</b>					
<b>Assessment Methods</b>					
<b>Lecture Schedule</b>					
<b>Sequence</b>	<b>Topics</b>	<b>Preliminary Preparation</b>			
1	Developing Efficient Algorithms				
2	Analysis of Searching and Sorting Algorithms				
3	Python Data Structures				
4	Data Analysis and Visualization				
5	Array-Oriented and Scientific Programming with NumPy and SciPy				
6	Data Manipulation with Pandas				
7	Data Loading, Storage, and File Formats; Data Visualization				
8	Time Series and Simple Linear Regression				
9	Natural Language Processing (NLP), Web Scraping				
10	Data Mining Twitter: Sentiment Analysis, JSON and Web Services				
11	Machine Learning: Classification, Regression and Clustering				
12	Deep Learning Convolutional and Recurrent Neural Networks				
13	Collaborative Filtering, Making Recommendations				
14	Optimization				
<b>Evaluation Methods</b>		<b>Weight(%)</b>			
Midterm Exam		30			
General Exam		70			

<b>Resources</b>
Intro to Python for Computer Science and Data Science: Learning to Program with AI, Big Data and The Cloud, Paul Deitel, Harvey Deitel, Pearson, 2020 - Toby Segaran, Programming Collective Intelligence, O'Reilly Press, 2007. - Brad Miller and David Ranum, Luther College, Problem Solving with Algorithms and Data Structures using Python, Franklin, Beedle & Associates, 2011