

Course Information								
Course Code	T	P	L	C	ECTS	Type C/E	Language TR/ENG etc.	Year/Semester
YMH2030	2	0	0	2	3	E	TR	2 /SPRING
Course Name (Turkish)	Temel Bilimlerde Yapay Zekâ							
Course Name (English)	Artificial Intelligence in Science							

Unit/Program	Physics Department/Undergraduate Program			
Course Prerequisite	There are no prerequisites			
Course Objectives	Learning general concepts about artificial intelligence Innovative AI applications Learning artificial intelligence applications in basic sciences			
Course Outline	Python basics, Python libraries specific to basic sciences, Python and chemistry-specific libraries, Machine learning basics, most used machine learning algorithms and approaches, Classification and prediction concepts in machine learning, machine learning in basic sciences, Designing machine learning models for applications in basic sciences, Deep learning and chemistry/physics/biology applications, innovative artificial intelligence tools, Fundamentals of Orange/Knime environments, Active and ethical use of generative AI,			
Textbook/ Material / Resources	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 3rd Edition, By Aurélien Géron, O'Reilly Media, Inc., 2023			
Internship Status				
Course Precedents				
University Name	Program Name	Course Name	T-P-L-C; ECTS	Type
EPFL in Switzerland	Chemistry	AI in Chemistry	3-0-3	-
Dublin City University	Chemistry	Chemistry with Artificial Intelligence	-	-
University of Southampton	Chemistry	Artificial Intelligence and Machine Learning in Chemistry	3-0-3	-
EPFL in Switzerland	Physics	Machine learning for physicists	3-0-3	-
The instructor who proposed the course (Title, Name and Surname)			Signature	
Instructors who can teach the course (Title, Name and Surname)			Signature	
Assoc. Prof. Dr. Ferhat Uçar				

Academic justification for the opening of the course? (The effect of course outcomes on program outcomes, etc.)
In current studies in the literature, especially in the processes where generative artificial intelligence is highly functional in research environments, the use of artificial intelligence in the fields of Physics-Chemistry-Biology should be able to be used, albeit at a basic level. The course title, which will also develop the ability to be effective in multidisciplinary studies, will enable students to improve their R&D levels.

Brief explanation of the course (theoretical lecture, applications, laboratory, studio, off-campus activity, using software, etc.)
The course, which will be explained with theoretical explanations and code sequences on some special topics, can also be enriched with project development systems that students can convey individually.

External Stakeholder Opinions About the Course (It is expected that the opinions to be obtained from the business world that will employ your graduates or from real or legal persons outside the University who have expertise on the subject of the course will be specified. Proof documents must be attached to this form.)	
Stakeholder Name	Opinion (It should be given as a summary, it should not exceed two lines.)

Weekly Course Content Distribution		
Week	Theory	Application/Laboratory
1	Basic concepts in artificial intelligence	
2	Introduction to the concept of machine learning	
3	Problem approaches where machine learning seeks solutions / classification – estimation / Linear regression approach	
4	Python fundamentals for machine learning model designs	
5	Pre-processing of datasets and data exploration with Numpy, Pandas libraries	
6	Visualization of basic science data sets and data discovery applications	
7	Build machine learning models with Python	
8	Processing of data in the Orange environment and examples of classification predictions	
9	Midterm Exam	
10	Processing data in the Knime environment and examples of classification predictions	
11	Examination and characteristics of libraries specific to Python Chemistry / Physics / Biology	
12	Introduction to the concept of deep learning and its application areas	
13	Deep learning applications in basic sciences	
14	Specific applications and ethical use of generative AI in basic sciences	
15	Finale	
16		

Assessment			
Evaluation Criteria	Activity	Custom	Contribution to Success Grade (%)
	Midterm Exams	1	40
	Quizzes		
	Assignments		
	Projects		
	Term Paper		
	Laboratory		
	Other		
	Final Exam	1	60
	Sum:		100
Remarks			

Content Design and Subject Weight (%)	Mathematics and Basic Sciences	30
	Engineering Sciences	70
	Social Sciences	
	Health Sciences	
	Educational Sciences	
	Culture and Art Sciences	
	Design Information	

Workload (ECTS) Calculation			
Events	Number	Duration (Hours)	Total workload (Hours)
Fieldwork			
Midterm Exam Application	1	3	3
Self-Study (including pre-class and exam preparation)	3	5	15
Make-up Exam	1	3	3
Experiment and Observation			
Class Participation (Theory)	14	2	28
Homework			
Final Exam Practice	1	3	3
Laboratory			
Article Review			
Writing an Article			
Reading	5	1	5
Case Study			
Performance			
Problem Solution	14	1	14
Project Preparation			
Project Submission			
Quiz			
Report Preparation			
Submitting Reports			
Role/Drama Work			
Seminar			
Oral Exam			
Team/Group Work			
Argument	5	1	5
Application/Practice			
Other			
TOTAL WORKLOAD:			76
ECTS CREDITS OF THE COURSE: (The number obtained as a result of Total Workload/25 is calculated by rounding to the whole number.)			3

		Program Outcomes (PO)										
		1	2	3	4	5	6	7	8	9	10	11
Learning Outcomes (LO) (Course Outcomes)												
1	Ability to design and implement experiments, use modern computational methods, collect data and analyze results in order to solve related research and problems	5	5	5	4	4	4	4	3	3	3	2
2	Students know the basic approaches and concepts of artificial intelligence applications.	4	4	5	5	2	3	4	5	5	4	1
3	Students know how to apply computational methods and artificial intelligence methods to analyze problems in basic science fields.	4	3	2	4	3	1	2	2	4	3	1
4	Students will be able to interpret generative AI concepts and use innovative tools	3	2	2	3	2	3	3	3	3	2	1

Organizer: Assoc. Prof. Dr. Ferhat UÇAR

Preparation Date: 20.05.2024