Faculty: Information Technology	
Department: Data Science and Artificial Intelligence	**Program: Bachelor**
Academic year:	**Semester:**

Course Plan

First: Course Information

Course No.:1505223	***Course Title: Artificial Intelligence Programming and Tools***	***Credit Hours: 3***	***Theoretical: 3***	***Practical:***
Prerequisite No. and Title: 1501112/1505101 Computer Programming 2 and Python Programming	***Section No.:***	***Lecture Time:***		
Level in JNQF	***7***			
Type Of Course:	☐ ***Obligatory University Requirement*** ☐ ***Elective University Requirement*** ☐ ***Obligatory Faculty Requirement*** ☐ ***Elective Faculty Requirement*** ■ ***Obligatory Specialization Requirement*** ☐ ***Elective Specialization Requirement*** ☐ ***Ancillary course***			
Type of Learning:	■ ***Face-to-Face Learning*** ☐ ***Blended Learning (2 Face-to-Face + 1 Asynchronous)*** ☐ ***Online Learning (2 Synchronous+ 1 Asynchronous)***			

Second: Instructor's Information

Course Coordinator:				
Name:		***Academic Rank:***		
Office Number:		***Extension Number:***	***Email:***	
Course Instructor:				
Name:		***Academic Rank:***		
Office Number:		***Extension Number:***	***Email:***	
Office Hours:	***Sunday***	***Monday***	***Tuesday***	***Wednesday*** ***Thursday***

Third: Course Description

This course builds upon the foundational knowledge acquired in the previous Python Programming course. Students will investigate deeper into the world of artificial intelligence (AI) programming and tools using Python. The course covers a range of advanced topics, including machine learning algorithms, data manipulation, and integration of popular AI libraries. Students will gain hands-on experience with real-world AI applications and develop the skills necessary to implement intelligent solutions.

Fourth: Course Objectives

1. To understand advanced Python concepts and libraries for AI development.
2. To explore and implement various machine learning algorithms.
3. To acquire proficiency in data manipulation and analysis using tools like NumPy and Pandas.
4. To develop skills in integrating AI libraries and tools for practical applications.
5. To apply AI programming techniques to real-world problem-solving.

Fifth: Learning Outcomes

Level descriptor according to (JNQF)	***CILOs Code***	***CILOs*** If any CLO will not be assessed in the course, mark NA.	***Associated PILOs Code*** *Choose one PILO for each CILO**	***Assessment method*** *Choose at least two methods*
Knowledge	**K1**	Demonstrate advanced understanding of Python programming concepts.	**PK1**	• Mid-term Exam • Final Exam
	K2	Explore and implement various machine learning algorithms.	**PK2**	• Mid-term Exam • Final Exam
	K3	Analyze and comprehend the significance of data manipulation and analysis in AI applications using NumPy and Pandas.	**PK4**	• Mid-term Exam • Final Exam
	K4	To apply AI programming techniques to real-world problem-solving.	**PK4**	• Mid-term Exam • Final Exam
Skills	**S1**	Develop Python scripts using advanced concepts, optimizing code for efficiency and readability.	**PS1**	• Mid-term Exam • Final Exam
	S2	Implement machine learning algorithms for classification, regression, and clustering tasks.	**PS2**	• Mid-term Exam • Final Exam
	S3	Manipulate and analyze large datasets using NumPy and Pandas to extract meaningful insights.	**PS2**	• Mid-term Exam • Final Exam
	S4	In practical applications, integrate and utilize popular AI libraries such as Tensor Flow and scikit-learn.	**PS3**	• Mid-term Exam • Final Exam

Competencies	**C1**	Develop efficient and readable Python code for AI applications.	**PC3**	• Mid-term Exam • Final Exam
	C2	Design and implement machine learning models for real-world problems.	**PC2**	Group Project
	C3	Apply critical thinking and problem-solving skills to design and implement AI solutions.	**PC4**	• Mid-term Exam Final Exam

*CILOs: Course Intended Learning Outcomes; PILOs: Program Intended Learning Outcomes; For each CILO, the PILO could be the same or different.

Sixth: Learning Resources

Main Reference:	***Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow***		
Author: Aurélien Géron	***Issue No.: 3rd ed.***	***Print: O'Reilly Media***	***Publication Year: 2022***
Additional Sources and Websites:	• ***Python for Data Analysis, Wes McKinney, 3rd ed., ISBN: 978-1098104030, O'Reilly Media, 2022*** • ***Natural Language Processing in Action, Hobson Lane and Maria Dyshel, 2nd ed., ISBN 9781617299445, 2024*** • ***Learning OpenCV 4 Computer Vision with Python 3, Joseph Howse and Joe Minichino, 3rd ed., 978-1789531619, Packt Publishing, 2020***		
Teaching Type:	☐ ***Classroom*** ■ ***Laboratory*** ☐ ***Workshop*** ■ ***MS Teams*** ■ ***Moodle***		

Seventh: Course Structure

Week	Course Intended Teaching Outcomes (CILOs)	Topics	Teaching Procedures*	Teaching Methods**	References***
Week 1	K1, S1, C1	Course Syllabus discussion. Review of Python Basics: - Python fundamentals. - Loops and control structures. - Functions. - File processing. - Lists, Tuples, and Dictionaries. - Numpy and Pandas.	Face-to-Face	Lecture, In-Lab Questions	- Course Outlines posted on Moodle. - Slides, in-lab task, and materials posted on Moodle.
Week 2	K1, S1, C1	Review of Python Basics: - Python fundamentals. - Loops and control structures. - Functions. - File processing. - Lists, Tuples, and Dictionaries.	Face-to-Face	Lecture, In-Lab Questions	- Course Outlines posted on Moodle. - Slides, in-lab task, and materials posted on Moodle.

		- Numpy and Pandas.			
Week 3	K1, K3, S1, S3, C1, C3	Data Manipulation with NumPy and Pandas: - Advanced NumPy operations. - Data cleaning and preprocessing with Pandas. - Data visualization with Matplotlib and Seaborn.	Face-to-Face	Lecture, In-Lab Questions	- Slides, in-lab task, and materials posted on Moodle.
Week 4	K1, K3, S1, S3, C1, C3	Data Manipulation with NumPy and Pandas: - Advanced NumPy operations. - Data cleaning and preprocessing with Pandas. - Data visualization with Matplotlib and Seaborn.	Face-to-Face	Lecture, In-Lab Questions	- Slides, in-lab task, and materials posted on Moodle. Chapter 1
Week 5	K1, K3, S1, S3, C1, C3	Data Manipulation with NumPy and Pandas: - Advanced NumPy operations. - Data cleaning and preprocessing with Pandas. - Data visualization with Matplotlib and Seaborn.	Face-to-Face	Lecture, In-Lab Questions	- Slides, in-lab task, and materials posted on Moodle. Chapter 1
Week 6	K1, K2, K3, S1, S2, S3, S4, C1, C3	Machine learning fundamentals: - Introduction to machine learning with scikit-learn. - Supervised learning algorithms (e.g., linear regression, decision trees) - Unsupervised learning algorithms (e.g., clustering, dimensionality reduction)	Face-to-Face	Lecture, In-Lab Questions	- Slides, in-lab task, and materials posted on Moodle. Chapter 1
Week 7	K1, K2, K3, S1, S2, S3, S4, C1, C3	Machine learning fundamentals: - Introduction to machine learning with scikit-learn. - Supervised learning algorithms (e.g., linear regression, decision trees) - Unsupervised learning algorithms (e.g., clustering, dimensionality reduction)	Face-to-Face	Lecture, In-Lab Questions	- Slides, in-lab task, and materials posted on Moodle. Chapter 1

Week 8	K1, K2, K3, S1, S2, S3, S4, C1, C3	Machine learning fundamentals: - Introduction to machine learning with scikit-learn. - Supervised learning algorithms (e.g., linear regression, decision trees) - Unsupervised learning algorithms (e.g., clustering, dimensionality reduction)	Face-to-Face	Lecture, In-Lab Questions	- Slides, in-lab task, and materials posted on Moodle. Chapter 1
Midterm Exams					
Week 9	K1, K2, K3, S1, S2, S3, S4, C1, C3	Integration of AI libraries: - Introduction to TensorFlow and Keras - Building neural networks with TensorFlow	Face-to-Face	Lecture, In-Lab Questions	- Slides, in-lab task, and materials posted on Moodle.
Week 10	K1, K2, K3, S1, S2, S3, S4, C1, C3	Integration of AI libraries: - Introduction to TensorFlow and Keras - Building neural networks with TensorFlow	Face-to-Face	Lecture, In-Lab Questions	- Slides, in-lab task, and materials posted on Moodle.
Week 11	K1, K2, K3, K4, S1, S2, S3, S4, C1, C2, C3	Real-World AI Applications: - Natural Language Processing (NLP) with spaCy - Image recognition with OpenCV	Face-to-Face	Lecture, In-Lab Questions	- Slides, in-lab task, and materials posted on Moodle.
Week 12	K1, K2, K3, K4, S1, S2, S3, S4, C1, C2, C3	Real-World AI Applications: - Natural Language Processing (NLP) with spaCy - Image recognition with OpenCV	Face-to-Face	Lecture, In-Lab Questions	- Slides, in-lab task, and materials posted on Moodle.
Week 13	K1, K2, K3, K4, S1, S2, S3, S4, C1, C2, C3	Revision	Face-to-Face	Lecture, In-Lab Questions	All material covered during the term
Week 14	K1, K2, K3, K4, S1, S2, S3, S4, C1, C2, C3	Project work and presentations	Face-to-Face	-	Project's Instruction Sheet
Final Exams					

*Teaching procedures: (Face-to-Face, synchronous, asynchronous).
** Teaching methods: (Lecture, video….).
*** Reference: (Pages of the book, recorded lecture, video….)

Eighth: Assessment Methods

Methods	Online Learning	Blended Learning	Face-To-Face Learning	Specific Course Output to be assessed **If any CILO will not be assessed in the course, mark NA.										
				K1	K2	K3	K4	S1	S2	S3	S4	C1	C2	C3
First Exam														
Second Exam														
Mid-term Exam			35	✓	✓	✓		✓	✓	✓	✓	✓		✓
Participation														
Asynchronous Activities														
Quizzes														
Assignments														
Group presentation			15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Final Exam			50	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total out of 100			100											

Ninth: Course Policies

- All course policies are applied to all teaching patterns (online, blended, and face-to-face Learning) as follows:
  a. Punctuality.
  b. Participation and interaction.
  c. Attendance and exams.
- Academic integrity: (cheating and plagiarism are prohibited).