Faculty: Information Technology	
Department: Computer Science	**Program: Master**
Academic year:	**Semester:**

Course Plan

First: Course Information

Course No.: 1501782	***Course Title: Machine Learning***	***Credit Hours: 3***	***Theoretical: 3***	***Practical: 0***
Prerequisite No. and Title:	***Section No.:***	***Lecture Time:***		
Level in JNQF	***9***			
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 master-level course in machine learning is designed to provide students with advanced knowledge and practical skills in the field of machine learning. The course will cover a wide range of topics, including advanced algorithms, deep learning, reinforcement learning, and applications in various domains. Emphasis will be placed on both theoretical understanding and hands-on implementation, preparing students for real-world applications of machine learning.

Fourth: Course Objectives

- Understand and critically evaluate advanced machine learning algorithms.
- Apply machine learning techniques to solve complex real-world problems.
- Implement and experiment with deep learning architectures.
- Analyse and optimize machine learning models for performance and efficiency.
- Explore applications of machine learning in various domains such as computer vision, natural language processing, and reinforcement learning.

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**	Recall the theoretical foundations of advanced machine learning algorithms, including relating them to fundamental machine learning concepts.	**PK1**	Mid-term Exam Final Exam
	K2	Repeat and explain the key assumptions, limitations, and potential biases of various advanced machine learning techniques.	**PK1**	Mid-term Exam Final Exam
	K3	Tell the difference between supervised, unsupervised, and reinforcement learning approaches in the context of advanced algorithms.	**PK2**	Mid-term Exam Final Exam
Skills	**S1**	Apply advanced machine learning algorithms to solve complex real-world problems in various domains.	**PS1**	Mid-term Exam Final Exam
	S2	Construct and evaluate machine learning pipelines, including data pre-processing, model creation, and hyperparameter tuning.	**PS2**	Mid-term Exam Final Exam
	S3	Compare the performance of different advanced machine learning algorithms for a specific task, interpreting the results critically.	**PS3**	Mid-term Exam Final Exam
	S4	Employ appropriate techniques for data analysis and visualization to interpret and communicate findings related to advanced machine learning models.	**PS3**	Mid-term Exam Final Exam
	S5	Develop a critical understanding of the ethical considerations surrounding the use of advanced machine learning models.	**PS3**	Mid-term Exam Final Exam

Competencies	**C1**	Collaborate effectively with peers in a team setting to solve complex machine learning problems.	**PC1**	Participation Project
	C2	Exhibit leadership in planning, executing, and presenting advanced machine learning projects. audiences.	**PC2**	Participation Project

*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 Book:	Machine Learning with PyTorch and Scikit-Learn: Develop machine learning and deep learning models with Python		
Author: Sebastian Raschka	***Issue No.:*** – Third Edition	***Print:*** – Packt Publishing,	***Publication Year:*** 2022
Additional Sources: Website:	• Thimira Amaratunga, Understanding Large Language Models: Learning Their Underlying Concepts and Technologies 1st ed. Edition Apress; 1st ed. edition (November 26, 2023) • Francois Chollet ,Deep Learning with Python, Second Edition 2nd Edition		
Teaching Type:	■***Classroom*** □ ***Laboratory*** □***Workshop*** ■ **MS Teams** ■ **Moodle**		

Seventh: Course Structure

Week	Course Intended Teaching Outcomes (CILOs)	Topics	Teaching Procedures*	Teaching Methods**	References***
1	K1, K2, S1 S2	**Introduction** fundamental concepts of machine learning, including the different types of machine learning	Face-to-Face	Lecture Preparation	---------
	K1, K2, S1 S2	Write a Summary	Asynchronous	Asynchronous	Chapter 1

2	K1, K2, K3, S2 S3	**Supervised Learning:** Nearest neighbor, Linear Regression, Logistic Regression, Decision Trees	Face-to-Face	Lecture Preparation	Chapter 2
	K1, K2, S2 S3	Write a Summary	Asynchronous	Asynchronous	Chapter 2
3	K1, K2, S3 S5	**Advanced Supervised Learning:** Ensemble methods (Bagging, Boosting) and Random Forests and XGBoot	Face-to-Face	Lecturing with active participation	Chapter 2
	K1, K2, S3 S5	Create a dataset	Asynchronous	Asynchronous	Chapter 2
4	K1, K2, K3, S1 S2	**Testing and Measurement:** Cross-validation techniques (K-fold cross-validation) Model evaluation and validation strategies Bias-variance tradeoff	Face-to-Face	Lecturing with active participation	Chapter 2
	K1, K2, K3, S1 S2	Upload dataset	Asynchronous	Asynchronous	Chapter 2
5	K1, K2, K3, S3 S5	**Deep Learning:** Neural network architectures	Face-to-Face	Lecturing with active participation	Chapter 2
	K1, K2, K3, S3 S5 C1	Create A model	Asynchronous	Asynchronous	Chapter 2
6	K1, K2, K3, S3,	**Deep Learning:** Convolutional Neural Networks (CNNs)	Face-to-Face	Lecturing with active participation	Chapter 3
	K1, K2, K3, S3 S5	Upload a Model to HF	Asynchronous	Asynchronous	Chapter 3
7	K1, K2, K3, S3,S4 S5	**Deep Learning:** Recurrent Neural Networks (RNNs) Transfer learning	Face-to-Face	Lecturing with active participation	Chapter 3
	K1, K2, K3, S3,S4 S5 C1, C2	One shot result for a Task	Asynchronous	Asynchronous	Chapter 3
Midterm Exams					
8	K1, K2, K3, S3,S4 S5	**Transformers and Language Models:** Transformer architecture	Face-to-Face	Lecturing with active participation	Chapter 3
	K1, K2, K3, S3,S4 S5, C1, C2	multi shot result for a Task	Asynchronous	Asynchronous	Chapter 3

9	K1, K2, K3,S1, S2.	**Transformers and Language Models:** Attention mechanisms	Face-to-Face	Lecturing with active participation	Chapter 3
	K1, K2, K3, C3, S1, S2.	Prompt Engineering	Asynchronous	Asynchronous	Chapter 3
10	K1, K2, K3, S3 S5	**Transformers and Language Models:** Fine-tuning language models for specific tasks	Face-to-Face	Lecturing with active participation	Chapter 3
	K1, K2, K3, S3 S5 C1, C2	Fine Tune using Qlora 1	Asynchronous	Asynchronous	Chapter 3
11	K1, K2, K3, S1 S2	**Transformers and Language Models:** Fine-tuning language models for specific tasks	Face-to-Face	Lecturing with active participation	Chapter 3
	K1, K2, K3, S1 S2	Fine Tune using Qlora 2	Asynchronous	Asynchronous	Chapter 3
12	K1, K2, K3, S1 S2	**Transformers and Language Models:** GPT (Generative Pre-trained Transformer) models **Applications:** Computer vision applications	Face-to-Face	Lecturing with active participation	Chapter 4
	K1, K2, K3, S1 S2	Models Comparisons	Asynchronous	Asynchronous	Chapter 4
13	S3, S4 S5 C1, C2	Presentation	Face-to-Face	Lecturing with active participation	
	S3, S4 S5 C1, C2	Presentation	Asynchronous		
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	S1	S2	S3	S4	S5	C1	C2
First Exam													
Second Exam													
Mid-term Exam			30	✓	✓	✓	✓	✓	✓	✓	✓		
Participation			10				✓	✓	✓	✓	✓	✓	✓
Asynchronous Activities													
Quizzes													
Assignments			20				✓	✓	✓	✓	✓	✓	✓
Group presentation													
Final Exam			40	✓	✓	✓	✓	✓	✓	✓	✓		
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).

Approval	Name	Date	Signature
Head of Department			
Faculty Dean			