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

Course Plan

First: Course Information

Course No.: 1505415	***Course Title: Applied Deep Learning***	***Credit Hours: 3***	***Theoretical: 3***	***Practical: 0***
Prerequisite No. and Title: - 1505311 Machine Learning	***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: Dr. Essam Al Daoud			***Academic Rank:***		
Office Number:	***Extension Number:***		***Email:***		
Office Hours:	***Sunday***	***Monday***	***Tuesday***	***Wednesday***	***Thursday***

Third: Course Description

This course focuses on learning complex, hierarchical feature representations from raw data. The dominant method for achieving this, artificial neural networks, has revolutionized the processing of data (e.g. images, videos, text, and audio) as well as decision-making tasks (e.g. game-playing). Its success has enabled a tremendous amount of practical commercial applications and has had significant impact on society.

Fourth: Course Objectives

1. Develop practical expertise in deep learning by actively engaging with popular frameworks such as TensorFlow or PyTorch. Students will build and train basic neural networks, gaining proficiency in applications like image classification and text generation through hands-on exercises.
2. Master the mathematical and algorithmic foundations of deep learning. Delve into concepts including gradient descent, backpropagation, and diverse neural network architectures like Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), fostering a robust theoretical understanding.
3. Apply deep learning to address real-world challenges across domains such as computer vision, natural language processing, and robotics. Students will learn to identify problems suitable for deep learning solutions, and apply their knowledge to implement solutions using real-world datasets.
4. Cultivate critical thinking skills essential for navigating the complexities of deep learning algorithms and data. Encourage students to analyze model limitations, address biases, and consider ethical implications, fostering a holistic approach to problem-solving in challenging scenarios.
5. Instill a mindset of continuous learning by keeping students informed about the latest advancements in deep learning. This objective encourages staying abreast of current research trends, emerging architectures, and best practices in the dynamic field of deep 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 and explain the fundamental concepts of deep learning, including artificial neural networks, gradient descent, and loss functions.	**PK1**	• Mid-term Exam • Final Exam
	K2	Repeat the mathematical notation and equations used to describe deep learning algorithms.	**PK1**	• Mid-term Exam • Final Exam
	K3	Recognize the trends and challenges of deep learning model training and deployment.	**PK4**	• Quizzes • Mid-term Exam • Final Exam
Skills	**S1**	Employ data preprocessing and regularization techniques to improve model accuracy and generalization.	**PS1**	• Mid-term Exam • Final Exam
	S2	Apply deep learning frameworks (TensorFlow, PyTorch, etc.) to build and train models for specific tasks.	**PS2**	• Mid-term Exam • Final Exam
	S3	Develop a plan for evaluating and deploying a deep learning model in a real-world scenario.	**PS3**	• Mid-term Exam • Final Exam
	S4	Analyze the results of deep learning experiments to identify trends and draw conclusions.	**PS2**	• Quizzes • Mid-term Exam • Final Exam
	S5	Recognize common errors and challenges encountered during deep learning model training and deployment.	**PS5**	• Quizzes • Mid-term Exam • Final Exam
Competencies	**C1**	Collaborate effectively with teammates in a project-based setting to design, implement, and evaluate a deep learning model.	**PC1**	• Participation • Project
	C2	Exhibit leadership in technical discussions and problem-solving activities related to deep learning.	**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 Reference:	***Python Deep Learning***		
Author: Ivan Vasilev	***Issue No.2nd ed.***	***Print:***	***Publication Year: 2019***
Additional Sources and Websites:	• ***Ian Goodfellow and Yoshua Bengio and Aaron Courville, Deep Learning, An MIT Press book,2016*** • ***Jason Brownlee, Develop Deep Learning Models for Natural Language in Python Jason Brownlee, 2017***		
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, K2, K3, S1, S2	Introduction Python Revision	Face-to-Face	Lecture, In-class Questions	---------
Week 2	K1, K2, K3, S1, S2	Numpy and pandas	Face-to-Face	Lecture, In-class Questions	Chapter 2
Week 3	K1, K2, K3, S3, S5	Neural Network Sklearn, Keras and Tenserflow	Face-to-Face	Lecture, In-class Questions	Chapter 3
Week 4	K1, K2, K3, S1, S2	Convolutional Neural Network	Face-to-Face	Lecture, In-class Questions	Chapter 5
Week 5	K1, K2, K3, S3, S5	CNN Applications	Face-to-Face	Lecture, In-class Questions	Chapter 6
Week 6	K1, K2, K3, S3, S5	Recurrent Neural Network, RNN Applications	Face-to-Face	Lecture, In-class Questions	Chapter 6 & Chapter 7
Week 7	K1, K2, K3, S3, S5	Transfer Learning	Face-to-Face	Lecture, In-class Questions	Chapter 7
Week 8	K1, K2, K3, S1, S2	Encoder Decoder	Face-to-Face	Lecture, In-class Questions	Chapter 7
Midterm Exams					
Week 9	K1, K2, K3, S3, S5	Encoder-Decoder Applications	Face-to-Face	Lecture, In-class Questions	Chapter 7
Week 10	K1, K2, K3, S1, S2	Transformers	Face-to-Face	Lecture, In-class Questions	Chapter 7

Week 11	K1, K2, K3, S3, S5	Transformers Applications	Face-to-Face	Lecture, In-class Questions	Chapter 7
Week 12	K1, K2, K3, S1, S2	Large Language Models	Face-to-Face	Lecture, In-class Questions	Chapter 8
Week 13	K3, S3, S5	Large Models Fine Tuning (LORA)	Face-to-Face	Lecture, In-class Questions	Chapter 8
Week 14	K3, S1 S2, C1, C2	QLORA & Revision and Discussion	Face-to-Face	Lecture, In-class Questions	Chapter 8
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			35	✓	✓	✓	✓	✓	✓	✓	✓		
Participation			5									✓	✓
Asynchronous Activities													
Quizzes													
Assignments			10									✓	✓
Group presentation													
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).