Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ DS & AI Department	QF01/0408-4.0E

Study plan No.	2024/2025		**University Specialization**	Data Science and Artificial Intelligence	
Course No.	0135341		**Course name**	Artificial Neural Networks and Deep Learning	
Credit Hours	**3**		**Prerequisite Co-requisite**	Machine Learning	
Course type	☐ MANDATORY UNIVERSITY REQUIREMENT	☐ UNIVERSITY ELECTIVE REQUIREMENTS	☐ FACULTY MANDATORY REQUIREMENT	☐ Support course family requirements	☐ Mandatory requirements	Elective requirements
Teaching style	☐ Full online learning		☐ Blended learning		Traditional learning	
Teaching model	☐ **2Synchronous: 1asynchronous**		☐ **1 face to face : 1synchronous**		**3 Traditional**	

Faculty member and study divisions information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	
Bilal Hawashin	**Associate professor**	**334**		**b.hawashin@zuj.edu.jo**	
Division number	**Time**	**Place**	**Number of students**	**Teaching style**	**Approved model**
1					

Brief description

This course is concerned with giving an introduction to deep learning neural networks. This course also focuses on theories and practical examples of deep learning algorithms and their applications, including intelligent neural networks (ANNs), deep learning building models, training and examination, in addition to their employment and applications. Understand the Fundamentals: By the end of the course, students should be able to demonstrate a deep understanding of the fundamental concepts and principles that underlie artificial neural networks, including the architecture of basic feedforward networks and activation functions. students should be proficient in implementing deep learning models using popular frameworks such as TensorFlow and PyTorch. They should be able to design, train, and evaluate neural networks for a variety of applications. should be capable of applying artificial neural networks and deep learning techniques to solve real-world problems through practical projects.

Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	Machine Learning: The Ultimate Guide to Machine Learning, Neural Networks and Deep Learning for Beginners Who Want to Understand Applications, Artificial Intelligence, Data Mining, Big Data and More by Herbert Jones | 2020.
Supportive learning resources (Books, databases, periodicals, software, applications, others)	1. Neural Networks for Beginners: An Easy-to-Follow Introduction to Artificial Intelligence and Deep Learning. by Brian Murray, 2023. 2. Learning Deep Learning: Theory and Practice of Neural Networks,

	Computer Vision, Natural Language Processing, and Transformers Using TensorFlow, by Magnus Ekman | Aug 17, 2021. 3. Neural Networks and Deep Learning: A Textbook second ed. 2020 Edition by Charu C. Aggarwal • Publisher : Springer; second ed. 2020 edition.			
Supporting websites				
The physical environment for teaching	Class room	☐ labs	☐ Virtual educational platform	☐ Others
Necessary equipment and software				
Supporting people with special needs				
For technical support				

Course learning outcomes (S *= Skills, C= Competences K= Knowledge,)*

No.	Course learning outcomes	The associated program learning output code
	Knowledge	
K1	To be acquainted with Neural Networks	**MK2**
K2	To have understanding of Deep Neural Networks:	**MK2**
K3	To be acquainted with Hyperparameter tuning, Regularization and Optimization	**MK2**
	Skills	
S1	To be able to use Tensorflow, Artificial Neural Networks, Machine Learning, Transfer Learning, and Multi-Task Learning	**MS2**
S2	To apply Convolutional Neural Networks, Recurrent Neural Networks, Transformers, Python Programming, Deep Learning, Backpropagation	**MS2**
S3	To be able to use Tensorflow, Artificial Neural Networks, Machine Learning, Transfer Learning, and Multi-Task Learning	**MS2**
	Competences	
C1	To use deep learning concepts to solve various real life problems	**MC1, MC2**

Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
First exam	0	**0**	%20	0
Second / midterm exam	%30	**%30**	%20	30%
Participation + Project-Based Learning	%30	**%20 + 10%**	0	0

final exam	%40	**%40**	%50	40%

Note: Asynchronous interactive activities are activities, tasks, projects, assignments, research, studies, projects, work within student groups ... etc, which the student carries out on his own, through the virtual platform without a direct encounter with the subject teacher.

Schedule of simultaneous / face-to-face encounters and their topics

Week	First Lecture (F2F)	Second Lecture (Activity)	ILOs	PLOs	JNQF Descriptors*
1	Introduction to Deep Learning	Video, Introduction to Deep Learning	ILO2, ILO5	PLO2, PLO4	K, S
2	Neural Networks Basics	Quiz1	ILO1, ILO4	PLO2, PLO4	K, S
3	Neural Networks Basics,HW	Reading, Neural Networks Basics	ILO1, ILO4	PLO2, PLO4	K, S
4	Shallow Neural Networks	Shallow Neural Networks, HW1	ILO1, ILO4	PLO2, PLO4	K, S
5	Shallow Neural Networks, Quiz	Quiz2	ILO1, ILO4	PLO2, PLO4	K, S
6	Deep Neural Networks	Video, Deep Neural Networks	ILO2, ILO5	PLO2, PLO4	K, S
7	Deep Neural Networks,HW	Reading, Deep Neural Networks	ILO2, ILO5	PLO2, PLO4	K, S
8	Neural Networks and Deep Learning	HW2	ILO2, ILO5	PLO2, PLO4	K, S
9	Neural Networks and Deep Learning, quiz	Neural Networks and Deep Learning	ILO2, ILO5	PLO2, PLO4	K, S
10	Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization, HW	Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization	ILO3, ILO5	PLO2, PLO4	K, S
11	Improving Deep	HW3	ILO3, ILO5	PLO2, PLO4	K, S

	Neural Networks: Hyperparameter Tuning, Regularization and Optimization				
12	Structuring Machine Learning Projects	Structuring Machine Learning Projects	ILO6	PLO5	C
13	Structuring Machine Learning Projects, HW	Structuring Machine Learning Projects, Quiz3	ILO6	PLO5	C
14	Convolutional Neural Networks	Natural Language Processing: Sequence Models	ILO2, ILO5	PLO2, PLO4	K, S
15	Project-Based Learning	Project-Based Learning	ILO6	PLO5, PLO6	C
16	Final Exam 40%				

*** Learning styles: Lecture, flipped learning, learning through projects, learning through problem solving, participatory learning ... etc.**
**** Reference: Pages in a book, database, recorded lecture, content on the e-learning platform, video, website ... etc.**

Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)

Week	Task / activity	Reference	Expected results
1	Video, Introduction to Deep Learning		Train a tiny NN on a real dataset (train/val/test) and report accuracy + confusion matrix.
2	Quiz1		Write 10 MCQ (with answers + why wrong options are wrong) covering the quiz concepts.
3	Reading, Neural Networks Basics		Implement forward propagation for a 2-layer neural network using NumPy only.
4	Shallow Neural Networks, HW1		Train a 1-hidden-layer NN using sigmoid/tanh/ReLU and compare convergence + accuracy.
5	Quiz2		Create a “mistake bank” of 10 common misconceptions + the correct reasoning for each.
6	Video, Deep Neural Networks		Demonstrate vanishing gradients by plotting gradient magnitude across

			depths (2/5/10/20 layers).
7	**Reading, Deep Neural Networks**		Produce a reusable deep-network design checklist (activation/init/LR/batch/diagnostics).
8	**HW2**		Implement L2 regularization + dropout and show their effect on overfitting (train vs val).
9	**Neural Networks and Deep Learning**		Reproduce one complete pipeline end-to-end and write a 10-line technical reflection.
10	**Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization**		Run a hyperparameter search (LR, batch, optimizer) and document best config + rationale.
11	**HW3**		Compare optimizers (SGD vs Momentum vs Adam) on the same model and summarize results in a table.
12	**Structuring Machine Learning Projects**		Create an ML project plan with error analysis, metrics, baselines, and iteration strategy.
13	**Structuring Machine Learning Projects, Quiz3**		Convert Quiz3 ideas into a 1-page decision tree for “what to try next when performance is bad”.
14	**Natural Language Processing: Sequence Models**		Build a simple text classifier using an RNN/LSTM/GRU and evaluate with F1-score.
15	**Project (PBL)**		Build a complete mini-project (data → model → evaluation → report) and publish it as a clean GitHub repo.
16			