Future Academy
Higher Future Institute for Specialized Technological Studies

Course Specification

1- Course information:	
Course Code:	CSC341
Course Title:	Neural Networks
Year/level	3rd
Academic Programs	Computer Science Program (B.Sc.)
Contact hours/ week	(Theoretical = 2, Practical = 2, Total = 4)

2- Course aims:

This course introduces the theory and practice of neural computation. It offers the principles of neuro-computing with artificial neural networks (ANNs) that widely used for addressing real-world problems such as classification, regression, pattern recognition, data mining and time-series prediction.
The course will cover: machine learning principles, regression, classification, artificial neural network, perceptron, backbropagation algorithm and Self Organizing Networks.

3- Intended learning outcomes of the course (ILOs):

a- Knowledge and understanding:

On successful completion of this course, the student should be able to:
a1- Understand the basic fundamentals of the neural networks and its practical applications.
a2- Demonstrate the principles of artificial intelligence, image, and pattern recognition.
a3- Utilize the extent to which a computer-based system meets the criteria defined for its current use and future development.
a4- Select advanced topics to provide a deeper understanding of some aspects as artificial intelligence, and parallel and concurrent computing.

b- Intellectual skills:

On completing this course, the student should be able to:
b1- Think in simulating the human brain with an artificial neural network.
b2- Learn how to build supervised and unsupervised neural network in simple applications.
b3- Realize the concepts, principles, theories and practices of neural networks.
b4- Perform classifications problems and evaluate the results of tests.

B5- Compare between different neural networks architectures.

c- Professional and practical skills:

At the end of this course, the student will be able to:

c1- Build a simple neural network with Mat-Lab tool and try to perform simple training to his network with a small dataset.
c2- Interact with the activation function the weight matrix for a given neural network.
c3- Use the neural networks in some applications like pattern recognitions and classification.
c4- Adapt the weight matrix of a given neural network during the training process in a small dataset.
c5- Analyze software tools and packages in Matlab which used in neural networks.

d- General and transferable skills:

On successful completion of this course, the student should be able to:

d1- Adapt a range of learning resources to manage one's own learning.
d2- Gain skills of working in groups, team management, time management and organizational skills.
d3- Show the use of information-retrieval.

4- Course contents

Topics/units	Number of hours		ILO's
	Lecture hours	Practical hours	
Introduction to Introduction to Neural networks			
Supervised and unsupervised learning methods			
Basic Neural network models			
Perceptron and Adaline			
Backpropagation algorithm			
Un-supervised Pre-training model, , restricted Boltzmann machine, and deep belief network			
Reinforcement learning			
Recurrent neural network, long term short memory (LSTM) and GRU			

5- Teaching and learning methods

Methods	ILO's																			
	a1	a2	a3	a4	a5	b1	b2	b3	b4	b5	c1	c2	c3	c4	c5	d1	d2	d3	d4	d5
Lectures																				
Training visits																				

Practical sections																			
Self-learning																			
Summer training																			
Assays and reviews																			
Discussion groups																			

6- Teaching and learning methods for Low-achieving students

- Extra teaching hours for those who need help
- More quizzes to assess their ability for understanding the course
- Encourage the team work for those students with other advanced ones to increase their participation and understanding

7- Student assessment

Assessment method	Time	Grade weight (%)	ILOs
Written exam			
Practical exam			
Oral exam			
Mid-term exam			
Others			

8-List of references

8.1. Student notebooks:

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8.2. Essential textbooks:

- Fundamentals of Neural Networks: Architectures, Algorithms and Applications, by Laurene V. Fausett.
- Principe, Euliano, and Lefebvre, "Neural and Adaptive Systems: Fundamentals through Simulations", John Wiley and Sons, ISBN: 0471351679.
- Deep Learning, MIT, by Ian Goodfellow, Yoshua Bengio, Aaron Courville, 2016

8.3. Recommended textbooks:

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8.4. Journals, Periodical and Reports ……..etc.

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8.5. Websites

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Course Coordinator:
Head of department: *Prof. Dr. Yasser F. Ramadan*
Date of Approval: 24/7/2024