



Course	Advanced AI and Machine Learning – 0907743 (3 Cr. – Elective Course)
Catalog Description	Theory and implementation of state-of-the-art machine learning algorithms for large-scale real-world applications. Topics include supervised learning (regression, classification, kernel methods, neural networks, and regularization) and unsupervised learning (clustering, density estimation, and dimensionality reduction). Term projects.
Prerequisites by Course	None
Prerequisites by Topic	Students are assumed to have good background in mathematics, particularly, calculus, linear algebra, statistics, and probability. Additionally, the students should have good programming skills, preferably, using Python.
Textbooks	<ol style="list-style-type: none">1. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow: Concepts: Tools, and Techniques to Build Intelligent Systems, 2nd Edition, O'Reilly Media, Oct 2019.2. François Chollet, Deep Learning with Python, Manning Pub. 2018.
References	<ol style="list-style-type: none">1. Prateek Joshi, Artificial Intelligence with Python, Packt Publishing, 2017.2. Theodoridis S, Koutroumbas K, Pattern Recognition, 3rd ed. Academic Press, 2006.3. Richard O. Duda, Peter E. Hart and David G. Stork, Pattern Classification, 2nd ed. Wiley Interscience, 2001.
Course Website	http://www.abandah.com/gheith/?page_id=2676
Microsoft Team	Link
Schedule & Duration	15 weeks; 45 lectures, 60 minutes each (including exams)
Student Material	Textbook, class handouts, some instructor keynotes, selected YouTube videos, and access to a personal computer and the internet.
College Facilities	Classroom with whiteboard and projection display facilities with speakers, library, and computer laboratory.
Course Objectives	The objectives of this course are: <ol style="list-style-type: none">1. Introduce students to the techniques used in ML including data preparation, training models, classification, neural networks, and deep learning.2. Introduce students to the practical techniques used in developing ML systems including sample collection, training, and evaluation.3. Introduce students to the programming techniques and libraries used in ML (Python, Scikit-Learn, Keras, and TensorFlow).
Course Outcomes and Relation to ABET Program Outcomes	Upon successful completion of this course, a student should be able to: <ol style="list-style-type: none">1. Solve an AI problem by developing an appropriate ML system [3].2. Communicate the development of a ML system through a detailed technical report and a short presentation [5, 7].3. Use Python and its specialized libraries to develop programs for solving ML

problems [3].

Course Topics

- Introduction
- Python programming language
- Data preparation and regression
- Classification
- Training models
- Classical techniques: SVM, decision trees and ensembles
- Unsupervised learning and clustering

Midterm Exam

- Neural networks
- Deep neural networks
- Convolutional neural networks
- Recurrent neural networks
- Reinforcement learning
- Recommendation systems

Computer Usage

Practical aspects of the course are covered in class and through the term project.

Important Dates

<u>Date</u>	<u>Event</u>
Tue 23 Feb, 2021	Classes Begin
TBA, 2021	Midterm Exam
Tue 20 Apr, 2021	Term project proposal is due
Tue 25 May, 2021	Term project report is due and project presentations
Tue 25 May, 2021	Last Lecture
Sun 30 May, 2021	Last Date to Withdraw
Jun 1 - 14, 2021	Final Exam Period

Policies

- Attendance is required. Class attendance will be taken every class and the university's policies will be enforced in this regard.
- All submitted work must be yours
- Cheating will not be tolerated
- Open-book exams
- Check department announcements at: <https://www.facebook.com/Master-in-Computer-Engineering-and-Networks-in-the-University-of-Jordan-257067841079897/> for the program announcements.

Assessments

Exams and term project

Grading policy

Term project report and presentation	30%
Midterm Exam	30%
Final Exam	40%

Instructors

Prof. Gheith Abandah

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Homepage: <http://www.abandah.com/gheith>

Office Hours: Sun through Thu: 8:00 am – 4:00 pm

Time and Location

Section 1: Tue: 4:00–7:00, CPE 001, [Microsoft Teams](#)

Last Updated

Feb 19, 2021

Learning Outcomes for the Master's program in Computer Engineering and Networks

Upon completion of the Computer Engineering and Networks program, the student is expected to be able to:

1. Discuss and analyze the basic concepts, principles, techniques and theories in the fields of computer architecture, wired and wireless networks, and security of computer network systems.
2. Employ higher-order thinking skills, critical and creative thinking, and practice scientific thinking and logical analysis in investigating, diagnosing and addressing the issues and problems related to computer engineering and networks.
3. Perfectly use the methods and techniques related to the fields of computer engineering in the design, analysis and management of systems and resources.
4. Show an interest in independent self-learning and continuous professional development, demonstrate commitment to acquire and generate unique knowledge and skills, and propose new ideas and programs that contribute to the development of the science of computer engineering and networks.
5. Demonstrate the proficiency and practice precision in achievement, work effectively in a team environment, and prepare presentation on important and modern topics that will develop the techniques used in the fields of computer engineering and networks.
6. Fulfill his/her responsibilities, exercise his/her rights and duties within the value system of the society, and properly deal with the national institutions and the local community.
7. Efficiently employ the research methodologies and the tools emerging from them, the methods for data collection, analysis and interpretation in the preparation of his/her thesis, and the preparation of different types of research related to computer engineering and networks. Accordingly, he/she prepares qualitative reports in the light of its results.
8. Assess changes that have been occurred in the field of computer engineering and networks, analyze various factors that control it domestically, regionally and globally, investigate and diagnose the network of relations and international interactions that influence it, and provide scenarios for its possible future developments.