

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Machine Learning

Course Code: 14016163-3

Date: 2018 –10 – 21.

Institution: Umm Al-Qura University

College: College of Computer and Information Systems Department: Department of Computer Science

A. Course Identification and General Information

1. Course title and code: Machine Learning 14016163-3

2. Credit hours: 3

3. Program(s) in which the course is offered. Master of Computer Science (Artificial Intelligence)
(If general elective available in many programs indicate this rather than list programs)

4. Name of faculty member responsible for the course Dr. Mohsin Bilal

5. Level/year at which this course is offered: 1

6. Pre-requisites for this course (if any):

7. Co-requisites for this course (if any):

8. Location if not on main campus:

9. Mode of Instruction (mark all that apply):

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|-------------------------------------|----------------------|-------------|----------------------------------|
| a. Traditional classroom | <input type="text"/> | percentage? | <input type="text" value="100"/> |
| b. Blended (traditional and online) | <input type="text"/> | percentage? | <input type="text"/> |
| c. E-learning | <input type="text"/> | percentage? | <input type="text"/> |
| d. Correspondence | <input type="text"/> | percentage? | <input type="text"/> |
| f. Other | <input type="text"/> | percentage? | <input type="text"/> |

Comments:

B Objectives

1. The main objective of this course

This course serves as an introductory class into the field of Machine Learning.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

The contents will be prepared from globally recognized text books, web-based reference materials and latest research in the field. Practical home works and a term project related to latest tools and techniques will also be designed. At the end of the course, a seminar day can be announced in which students can present their course projects and literature review.

C. Course Description (Note: General description in the form used in the program's bulletin or handbook)

Course Description:

This course introduces the students to the field of Machine Learning (ML). ML is concerned with building systems and developing algorithms able to learn from past experiences to gain some insights of the future experiences. This course will overview some of the important concepts and techniques related to ML from both theoretical and practical perspectives.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Learning Theory	2	6
Convergence, Bias/Variance tradeoff, VC theory, Large Margins	2	6
Supervised Learning (SVM, Naive Bayes, etc.)	2	6
Unsupervised Learning	1	3
Decision Trees and Random Forests	2	6
Genetic Algorithms	2	6
Kernel Methods	1	3
Deep Learning	1	3
Reinforcement Learning	1	3

2. Course components (total contact and credit hours per semester):							
		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42					42
	Actual	42					42
Credit	Planned	3					3

	Actual	3					3
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3. Individual study/learning hours expected for students per week.	9-12
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4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	Knowledge		
1.1	Understand the fundamental concepts of machine learning and learning theory	Lecture, Group discussion	Exams, HWs, Quizzes
1.2	Recognize a variety of techniques to model supervised learning via regression and classification	Lecture, Group discussion	Exam, HWs, Quizzes
1.3	Recognize a variety of techniques to model unsupervised learning	Lecture, Group discussion	Exam, HWs, Quizzes
1.4	Recognize the fundamental concepts and techniques of reinforcement and deep learning	Lecture, Group discussion	Exams, HWs, Quizzes
2.0	Cognitive Skills		
2.1	Design and implement a machine learning based system, process, component or program to meet desired needs.	Lecture, Case studies, research activities, Group discussion	Exams, Reports, Project
3.0	Interpersonal Skills & Responsibility		
3.1	Work effectively in groups to accomplish a common goal and show leadership qualities	Small group discussion, research activities, Projects	Project Report, Group presentation
3.2	Act ethically and responsibly with high moral standards	Research activities, Project	Anti-plagiarism Presentation
4.0	Communication, Information Technology, Numerical		
4.1	Ability to communicate clearly in oral and written form with range of audiences	Project	Project Report, Group presentation

4.2	Use of latest information technologies	Lectures, Project	Project Report, Home works, presentation
5.0	Psychomotor (if any)		
5.1	Ability to operate and construct necessary tools required related to the subject	Research activities, Projects	Project, HWs, presentations

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Quiz 1	2	2.5%
2	Homework 1	3	2.5%
3	Quiz 2	4	2.5%
4	Homework 2	5	2.5%
5	Quiz 3	6	2.5%
6	Homework 3	7	2.5%
7	Midterm Exam	9	20%
8	Quiz 4	11	2.5%
9	Homework 4	12	2.5%
10	Project	13	30%
11	Final Exam	15	30%

D. Student Academic Counseling and Support

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| <ol style="list-style-type: none">1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)<ol style="list-style-type: none">i. Office Hours for student counseling and support – Three hours/weekii. Availability of teaching Staff on e-learning resources like uqu20/Piazza |
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E Learning Resources

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| <ol style="list-style-type: none">1. List Required Textbooks<ol style="list-style-type: none">i. S. Russell and P. Norvig. Artificial Intelligence: A Modern Approach. Prentice Hall, latest edition.ii. Bishop, Christopher M. Pattern recognition and machine learning. springer, latest edition.iii. Charu C. Aggarwal. Neural Networks and Deep Learning: A Textbook Hardcover, latest edition. |
| <ol style="list-style-type: none">2. List Essential References Materials (Journals, Reports, etc.)<ol style="list-style-type: none">i. Recent Papers in Machine Learning related journals |
| <ol style="list-style-type: none">3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.<ol style="list-style-type: none">i. |
| <ol style="list-style-type: none">4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.<ol style="list-style-type: none">i. MATLAB, Python, WEKA or similar software |

F. Facilities Required

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| Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.) |
| <ol style="list-style-type: none">1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)<ol style="list-style-type: none">i. One classroom (25 seats)ii. One lab (25 PCs)2. Technology resources (AV, data show, Smart Board, software, etc.)<ol style="list-style-type: none">i. Whiteboardii. Internet connectioniii. Anti-plagiarism software3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) |

G Course Evaluation and Improvement Procedures

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| <ol style="list-style-type: none">1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching |
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<p>i. At the end of semester, course evaluation forms will be filled by the students electronically or on paper. The evaluation forms will be anonymous.</p>
<p>2. Other Strategies for Evaluation of Teaching by the Instructor or the Department</p> <p>i. Course file of the course will be maintained and evaluated by some senior faculty member.</p> <p>ii. Instructor evaluation is performed for every semester</p>
<p>3. Procedures for Teaching Development</p> <p>i. Constant reading of new books and research papers, attending related conferences and workshops, participation in the research groups and blogs etc.</p>
<p>4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution)</p> <p>i. A random sample from the marked papers may be evaluated by an independent senior faculty member.</p> <p>ii. Departmental quality assurance committee can review the students grades and course files to make sure that high standard of teaching is maintained.</p>
<p>5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.</p> <p>i. Department has curriculum committee that periodically review courses.</p> <p>ii. Faculty council review offer program as per need.</p>

Name of Course Instructor: Dr. Mohsin Bilal

Signature: Mohsin Bilal **Date Completed:** Oct. 22, 2018

Program Coordinator: _____

Signature: _____

Date Received: _____