COURSE SPECIFICATIONS
Form

Course Title: Deep Learning

Course Code: 14016484-3

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: <u>Deep Learning 14016484-3</u>
2. Credit hours: <u>3</u>
3. Program(s) in which the course is offered. <u>Master of Computer Science (Artificial Intelligence)</u>   (If general elective available in many programs indicate this rather than list programs)
4. Name of faculty member responsible for the course <u>Dr. Mohsin Bilal</u>
5. Level/year at which this course is offered:<u>2/3</u>
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):
    a. Traditional classroom   [ ]   percentage?   [100]
 	
    b. Blended (traditional and online)   [ ]   percentage?   [ ]
 	
    c. E-learning   [ ]   percentage?   [ ]
 	
    d. Correspondence   [ ]   percentage?   [ ]
 	
    f. Other   [ ]   percentage?   [ ]
 	
 Comments:

B Objectives

1. The main objective of this course This course provides theoretical and practical knowledge of deep 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 is an introduction to deep learning, a branch of machine learning concerned with the development and application of modern neural networks. Deep learning algorithms extract layered high-level representations of data in a way that maximizes performance on a given task. A range of topics will be covered from basic neural networks, convolutional and recurrent network structures, deep unsupervised and reinforcement learning, and applications to problem domains like speech recognition and computer vision.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Fundamentals of deep learning	2	6
Deep feedforward neural networks	2	6
Regularization of deep learning	2	6
Convolutional networks	2	6
Sequence modeling (recurrent and recursive networks)	2	6
Probabilistic models for deep learning	2	6
Deep reinforcement Learning	2	6

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

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 fundamentals and regularization of deep neural networks		Lecture, Group discussion	Exams, Homework, Quizzes
1.2	Understand the convolutional and deep recurrent neural networks		Lecture, Group discussion	Exam, Homework, Quizzes
1.3	Understand the deep probabilistic models and reinforcement learning		Lecture, Group discussion	Exam, Homework, Quizzes
2.0	**Cognitive Skills**			
2.1	Design and implement a deep learning-based system, process, component or program to meet desired needs.		Lecture, Case studies, research activities, Group discussion	Exams, Reports, Project
2.2	Investigate real world problems in the context of Deep Learning and design innovative solutions		Lecture, Case studies, research activities, Group discussion	Exams, Reports, Project
3.0	**Interpersonal Skills & Responsibility**			
3.1	Demonstrate own learning and professional development		Small group discussion, research activities, Projects	Project Report, Group presentation
3.2	Work effectively in groups to accomplish a common goal and show leadership qualities		Small group discussion, research activities, Projects	Project Report, Group presentation
3.3	Act ethically and responsibly with high moral standards		Small group discussion, research activities, Projects	Anti-plagiarism software's, Project

			Report, Group presentations
4.0	Communication, Information Technology, Numerical		
4.1	Ability to communicate clearly in oral and written form with range of audiences	Project research activities, Project	Project Report, Group presentation
4.2	Use of latest information technologies	Lectures, research activities, Project	Project Report, Group presentation
5.0	**Psychomotor (if any)**		
5.1	Ability to operate and construct necessary tools required for an intelligent system	Research activities, Projects	Reports, Research paper, Group 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	3.3%
2	Homework 1	3	3.3%
3	Quiz 2	4	3.3%
4	Homework 2	5	3.3%
5	Midterm Exam	8	20%
6	Quiz 3	10	3.3%
7	Homework 3	11	3.3%
8	Project Report	13	30%
9	Final Exam	15	30%

D. Student Academic Counseling and Support

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)

    i.   Office Hours for student counseling and support – Three hours/week

    ii.   Availability of teaching Staff on e-learning resources like uqu20/Piazza

E Learning Resources

1. List Required Textbooks

    i.   Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. "Deep learning (adaptive computation and machine learning series)." Adaptive Computation and Machine Learning series, latest edition.

    ii.   Buduma, Nikhil, and Nicholas Locascio. Fundamentals of Deep Learning: Designing Next-generation Machine Intelligence Algorithms. " O'Reilly Media, Inc.", latest edition.

    iii. Josh Patterson and Gibson, Adam. "Deep learning: a practitioner's approach. O'Reilly Media; 1 edition, latest edition.

2. List Essential References Materials (Journals, Reports, etc.)

    i.   Recent Papers in Deep Learning and AI related journals

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

    i.

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

    i.   MATLAB, Python, or similar software

F. Facilities Required

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.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

    i.   One classroom (25 seats)

    ii.   One lab (25 PCs)

2. Technology resources (AV, data show, Smart Board, software, etc.)

    i.   Whiteboard

    ii.   Internet connection

    iii. Anti-plagiarism software

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

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.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
i.   Course file of the course will be maintained and evaluated by some senior faculty member.   ii.   Instructor evaluation is performed for every semester
3. Procedures for Teaching Development
i.   Constant reading of new books and research papers, attending related conferences and workshops, participation in the research groups and blogs etc.
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)
i.   A random sample from the marked papers may be evaluated by an independent senior faculty member.   ii.   Departmental quality assurance committee can review the students grades and course files to make sure that high standard of teaching is maintained.

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.
   i.   Department has curriculum committee that periodically review courses.
   ii.   Faculty council review offer program as per need.

Name of Course Instructor: Dr. Mohsin Bilal

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

Program Coordinator: _____

Signature: _____   **Date Received:** _____