4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Neural Network

Course Code: 14016262-3

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: Neural Network 14016262-3
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: 2
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 neural networks and their application in real world applications.

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:

In this course the students will be introduced to various neural network models and algorithms, adaptive behavior, associative learning, competitive dynamics and biological mechanisms. Several applications of artificial neural networks will be studied including computer vision, cognitive information processing, control, and signal analysis.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Model Building through Regression	1	3
The Least-Mean-Square Algorithm	1	3
Multilayer Perceptrons	1	3
Kernel Methods and Radial-Basis Function Networks	1	3
Support Vector Machines	1	3
Regularization Theory	1	3
Principal-Components Analysis (PCA)	1	3
Self-Organizing Maps (SOM)	1	3
Information-Theoretic Learning Models	1	3
Stochastic Methods	1	3
Dynamic Programming	1	3
Neurodynamics	1	3
Bayesian Filtering for State Estimation of Dynamic Systems	1	3
Dynamically Driven Recurrent Networks	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

3. Individual study/learning hours expected for students per week.	9-12

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 basics of neural network design, algorithms, and supervised model building though regression and MLP	Lecture, Group discussion	Exams, Homework, Quizzes
1.2	Understand different types of neural network including RFB, SVM and regularization theory	Lecture, Group discussion	Exam, Homework, Quizzes
1.3	Understand PCA and SOM and different learning models	Lecture, Group discussion	Exam, Homework, Quizzes
1.4	Understand Neurodynamics and Dynamically Driven Recurrent Networks	Lecture, Group discussion	Exams, Homework, Quizzes
2.0	**Cognitive Skills**		
2.1	Design and implement an ANN 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 Neural Network and design innovative solutions	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 research activities, Project	Project Report, Group presentation
5.0	**Psychomotor (if any)**		
5.1			

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	Midterm Exam	7	20%
6	Quiz 3	8	2.5%
7	Homework 3	9	2.5%
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

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. Haykin, Simon S. Neural networks and learning machines. Vol. 3. Upper Saddle River, NJ, USA: Pearson, latest edition ii. Demuth, Howard B., Mark H. Beale, Orlando De Jess, and Martin T. Hagan. Neural network design. Martin Hagan, latest edition. iii. Rojas, Raúl. Neural networks: a systematic introduction. Springer Science & Business Media, latest edition. iv. Samarasinghe, Sandhya. Neural networks for applied sciences and engineering: from fundamentals to complex pattern recognition. CRC Press, latest edition.
2. List Essential References Materials (Journals, Reports, etc.) i. Recent Papers in Neural Networks 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:** _____