4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Advanced Mathematics for AI

Course Code: 14016161-3

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: Advanced Mathematics for AI 14016161-3
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. Khaled Tarmissi
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):

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 knowledge of Advanced Mathematics for Artificial Intelligence

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 a refresher course to the mathematical methods needed in understanding the concepts of AI. It covers the basics of linear algebra, calculus, and complex analysis. The main goal of the class is for students to gain practical experience of the mathematical methods and tools that are essential in AI.

1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
Introduction to Mathematical Problems in AI	1	3
Recursion and Induction	1	3
Heuristic Search	1	3
Proposition and Predicate Logic	1	3
Resolution and Propositional Calculus	1	3
First Order Predicate Calculus	1	3
Nonmonotonic Reasoning	1	3
Probability Theory	2	6
Bayesian Networks	1	3
Fuzziness and Belief Theory	2	6
Decision Trees	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

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	Understanding the knowledge of computing, statistics and mathematics appropriate to AI System	Lecture, Small group discussion,	Exams, Homework, Quizzes
2.0	**Cognitive Skills**		
2.1	Apply conceptual understanding of concepts, principles and theories related to AI	Lecture, Homework, Small group discussion, research activities	Exams, Homework, Quizzes
3.0	**Interpersonal Skills & Responsibility**		
3.1	Demonstrate own learning and professional development	Small group discussion, research activities, Projects	Exams, Homework, Quizzes
4.0	**Communication, Information Technology, Numerical**		
4.1	Use of latest information technologies	Lectures, research activities, case studies, Projects, Seminars	Exams, Homework, Quizzes
4.2	Demonstrate the ability to use mathematical and statistical techniques in the design and analysis of intelligent systems	Lecture, Homework, Small group discussion, research activities, case studies, Projects	Exams, Homework, Quizzes
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	Quizzes	3,5,7,11,13	20%
2	Homework	2,4,6,10,12	20%
3	Midterm exam	8	20%
4	Final exam	15	40%

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. Poole, David. Linear algebra: A modern introduction. Cengage Learning, 2014. ii. Shifrin, Theodore. Multivariable mathematics: linear algebra, multivariable calculus, and manifolds. John Wiley & Sons Inc, 2005. iii. Turyn, Lawrence. Advanced engineering mathematics. CRC Press, 2013.
2. List Essential References Materials (Journals, Reports, etc.) i. Recent Papers in AI/Mathematics 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. Khaled Tarmissi

Signature: *Khaled Tarmissi* **Date Completed:** Oct. 22, 2018

Program Coordinator: _____

Signature: _____ **Date Received:** _____