

**4/1/4. Course Specification:**

## **COURSE SPECIFICATIONS**

### **Form**

Course Title: Introduction to Robotics

Course Code: 14016478-3

**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: Introduction to Robotics 14016478-3

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 Termisi

5. Level/year at which this course is offered: 2/3

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            | <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 provides theoretical and practical knowledge of Robotics.

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 several core areas in robotics: kinematics, dynamics and control; motion planning; state estimation, localization and mapping; vision for robotics. Lectures on these topics will be complemented by a large practical that exercises knowledge of a cross section of these techniques in the construction of an integrated robot in the lab, motivated by a task such as robot navigation.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact hours
Introduction to Robotics	1	3
Kinematics - forward and inverse	2	6
Dynamics	1	3
Control	1	3
Sensing - proprioception, etc.	2	6
Motion planning - basics and sampling-based methods	2	6
Motion planning - planning under uncertainty, etc.	2	6
State estimation, localization and mapping	1	3
Implementing SLAM; Multi-modal sensor fusion	1	3
Machine vision	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
<b>1.0</b>	<b>Knowledge</b>		
1.1	Recognize the essential of design and implementation of robotics systems.	Lecture, Small group discussion, research activities.	Exams, Homework, Quizzes, Reports, presentations
1.2	An ability to recognize the use of robotics in solving real life problems.	Lecture, Small group discussion, research activities	Exams, Quizzes, Reports, Research paper, presentations
<b>2.0</b>	<b>Cognitive Skills</b>		
2.1	Apply conceptual understanding of concepts, principles and theories related to robotics	Lecture, Homework, research activities	Exams, Homework, Quizzes
2.2	Design, implement and evaluate an robotics based system, process, component, or program to meet desired needs.	Lecture, Homework, research activities, case studies, Projects	Exams, Quizzes, Reports, Research paper, presentations
2.3	Investigate real world problems in the context of robotics and design innovative solutions	Lecture, Homework, research activities, case studies, Projects	Exams, Quizzes, Reports, Research paper, presentations
<b>3.0</b>	<b>Interpersonal Skills &amp; Responsibility</b>		
3.1	Demonstrate own learning and professional development	Group discussion, Project	Project Report, Project presentation
<b>4.0</b>	<b>Communication, Information Technology, Numerical</b>		
4.1	Use of latest information technologies	Project	Project Report, Project presentation

<b>5.0</b>	<b>Psychomotor (if any)</b>		
5.1			

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

## D. Student Academic Counseling and Support

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| <p>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)</p> <ul style="list-style-type: none"><li>i. Office Hours for student counseling and support – Three hours/week</li><li>ii. Availability of teaching Staff on e-learning resources like uqu20/Piazza</li></ul> |
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## E Learning Resources

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|---|
| <p>1. List Required Textbooks</p> <ul style="list-style-type: none"><li>i. Niku, Saeed B. "Introduction to Robotics: Analysis, Control, Applications, Hoboke" latest edition.</li><li>ii. Fukuda, Toshio, ed. Soft Computing for Intelligent Robotic Systems. Vol. 21. Physica, latest edition.</li></ul> |
| <p>2. List Essential References Materials (Journals, Reports, etc.)</p> <ul style="list-style-type: none"><li>i. Recent Papers in Robotics related journals</li></ul>   |
| <p>3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.</p> <ul style="list-style-type: none"><li>i.</li></ul>  |
| <p>4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.</p> <ul style="list-style-type: none"><li>i. MATLAB, Python or similar software</li><li>ii. Robotic toolkit to build simple robots</li></ul>  |

## F. Facilities Required

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|---|
| <p>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.)</p>                                |
| <p>1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)</p> <ul style="list-style-type: none"><li>i. One classroom (25 seats)</li><li>ii. One lab (25 PCs)</li></ul>                     |
| <p>2. Technology resources (AV, data show, Smart Board, software, etc.)</p> <ul style="list-style-type: none"><li>i. Whiteboard</li><li>ii. Internet connection</li><li>iii. Anti-plagiarism software</li></ul> |
| <p>3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)</p>  |

## G Course Evaluation and Improvement Procedures

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| <p>1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching</p> |
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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>iii. Department has curriculum committee that periodically review courses.</p> <p>iv. Faculty council review offer program as per need.</p>

**Name of Course Instructor:** Dr. Khaled Termisi

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

**Program Coordinator:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Date Received:** \_\_\_\_\_