Module Specification

Fundamental Robotics Principles

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Contents

Part 1: Information

Module title: Fundamental Robotics Principles

Module code: UFMFKT-30-1

Level: Level 4

For implementation from: 2021-22

UWE credit rating: 30

ECTS credit rating: 15

Faculty: Faculty of Environment & Technology

Department: FET Dept of Engineering Design & Mathematics

Partner institutions: None

Delivery locations: Frenchay Campus

Field: Engineering, Design and Mathematics

Module type: Standard

Pre-requisites: None

Excluded combinations: None

Co-requisites: None

Continuing professional development: No

Professional, statutory or regulatory body requirements: None

Part 2: Description

Overview: This module introduces students to robotics, mechatronics and artificial intelligence (AI). Students will study mechanical movement (low-level control) and aspects of AI to provide a degree of autonomy (high level control) for a robot. Students will develop an understanding of robot components and decision making algorithms in order to design virtual intelligent robots. The learning is supported with simulation tools and practical experiments.

Features: Not applicable

Educational aims: The module equips students with the knowledge and understanding of theories, principles and applications of robotic systems. It introduces activities designed to develop their competencies in innovative, critical and systems thinking.

Outline syllabus: Syllabus Outline

Introduction to robotic movement and mechatronics

Awareness of various categories of robots and their applications

Principles of robotic mechatronics; mechanical/electrical/electronic integration

Sensing and actuating technology

Basic concepts on kinematics, statics, dynamics, and control of robots. Automation

Artificial intelligence for robotics

A brief history of artificial intelligence in robotics

Task-oriented control; concepts of planning and problem solving

Concepts of behavioural robotics

Artificial intelligence algorithms

Part 3: Teaching and learning methods

Teaching and learning methods: A combination of lectures and lab demonstrations are used to present core topics from the syllabus. Laboratory sessions are used for

familiarization of simulation software, and development of solutions.

Independent learning includes hours engaged with essential reading, and laboratory based development work undertaken outside the scheduled classes. Students will be expected to maintain a logbook of the work during practical sessions.

Module Learning outcomes: On successful completion of this module students will achieve the following learning outcomes.

MO1 Calculate and validate mechatronic principles for robotics [SM3b] {US1m, US3m}

MO2 Model robotic movement through the use of appropriate mathematical techniques [SM1b, EA2] {US1, E4}

MO3 Design artificial intelligence solutions to given simulated robotics problems [D2, D4] {D1i, D4}) [G1] {P1i, P1}

MO4 Maintain and write a record of experimental notes that are commensurate with industrial practice [P3, P7] {P2 and P7}

Hours to be allocated: 300

Contact hours:

Independent study/self-guided study = 228 hours

Face-to-face learning = 72 hours

Total = 300

Reading list: The reading list for this module can be accessed at readinglists.uwe.ac.uk via the following link

https://rl.talis.com/3/uwe/lists/72F1D9CC-5C56-5924-5BD8-ADF149783B7F.html

Part 4: Assessment

Assessment strategy: Assessment of this module consists of two components:

Component B consists of two parts. The first part will be a coursework assessment

for Semester 1 which consists of multiple laboratory assignments that are carried out periodically during the semester. This is used to assess competency in the technical aspects taught during the semester. The coursework assessment regime here has been devised to provide regular feedback and feed forward to assist students' progression in fundamental robotics principles and to prepare them for the examination.

The second part will be a group project report (2500 words) and a demonstration in Semester 2.

Component A will be an examination that assesses the student's understanding of analytical techniques applied to robotic systems.

Resit Strategy:

The resit assessment will have the same structure as the first sit with the exception that the report will be an individual report (1500 words).

Component A will be a written examination.

Assessment components:

Examination (Online) - Component A (First Sit)

Description: Online Written Examination (4 hours)

Weighting: 50 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO2, MO3

Laboratory Report - Component B (First Sit)

Description: A selection of laboratory reports that are submitted periodically.

Weighting: 15 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO3, MO4

Report - Component B (First Sit)

Description: A group project report (2500 words) and a demonstration.

Weighting: 35 %

Final assessment: Yes

Group work: Yes

Learning outcomes tested: MO2, MO3

Laboratory Report - Component B (Resit)

Description: A selection of laboratory reports from Semester 1.

Weighting: 15 %

Final assessment: No

Group work: No

Learning outcomes tested: MO1, MO3, MO4

Examination (Online) - Component A (Resit)

Description: Online Examination (4 hours)

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3

Report - Component B (Resit)

Description: An individual coursework report. The report will consist of two parts. The first part will require students to undertake and then write up a selection of laboratory sessions. The second part will require students to write a report on the development of a virtual robotic system (1500 words).

Weighting: 35 %

Final assessment: No

Group work: No

Learning outcomes tested: MO2, MO3

Part 5: Contributes towards

This module contributes towards the following programmes of study:

Robotics [Sep][SW][Frenchay][4yrs] BEng (Hons) 2021-22

Robotics [Sep][FT][Frenchay][3yrs] BEng (Hons) 2021-22

Robotics {Foundation}[Sep][SW][Frenchay][5yrs] BEng (Hons) 2020-21

Robotics {Foundation}[Sep][FT][Frenchay][4yrs] BEng (Hons) 2020-21