



## **Module Specification**

### **Intelligent and Adaptive Systems**

Version: 2023-24, v4.0, 29 Jun 2023

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## Part 1: Information

**Module title:** Intelligent and Adaptive Systems

**Module code:** UFMF99-15-3

**Level:** Level 6

**For implementation from:** 2023-24

**UWE credit rating:** 15

**ECTS credit rating:** 7.5

**College:** College of Arts, Technology and Environment

**School:** CATE School of Engineering

**Partner institutions:** None

**Field:** Engineering, Design and Mathematics

**Module type:** Module

**Pre-requisites:** Mathematical Modelling for Electronics and Robotics 2021-22

**Excluded combinations:** None

**Co-requisites:** None

**Continuing professional development:** No

**Professional, statutory or regulatory body requirements:** None

## Part 2: Description

**Overview:** This module explores the application of intelligent and adaptive systems in a range of problem domains which are relevant to Robotics and other branches of engineering. The defining characteristics of these systems include autonomy, learning, pattern recognition and the ability to deal with uncertain and imprecise data.

**Features:** Not applicable

**Educational aims:** The aim of this modules is to equip students with an interdisciplinary knowledge of classical artificial intelligence, psychology, robotics, ethology, neuroscience and classical control. This will give students the ability to apply problem solving techniques to uncertain scenarios.

**Outline syllabus:** Introduction: Review of the links with other disciplines, e.g. classical AI, psychology, robotics, ethology, neuroscience and classical control. Scope and limitations of this module, especially with respect to classical control and AI.

Learning and adaptive systems: Working definitions of intelligence, adaptive systems and learning. Adaptation through learning versus design.

Basic Architectures: Neural networks. Fuzzy systems. Evolutionary computation. Supervised, unsupervised and reinforcement learning.

Example applications: Review of work carried out in this Faculty, and at other establishments, in order to demonstrate the major strengths and weaknesses of the techniques. For example; intelligent multiple agents for fault diagnosis in electrical power distribution systems, fuzzy control of an automated underground transportation system, co-operative behaviour in multi-agent mobile robotics, neurocontrol of an industrial robot manipulator, fuzzy classifier systems for telecommunications network routing, evolutionary computation as an aid to engineering design, human face and handwriting recognition using neural networks.

### **Part 3: Teaching and learning methods**

**Teaching and learning methods:** Lectures will introduce the fundamental concepts. Tutorial case study sessions will be used for two purposes. They will be used to expose students to demonstrations of the basic architectures in action. They will also be used to discuss real implementations of these new techniques, each designed to illustrate the essential details of a particular concept or technique, and especially its strengths and weaknesses in both technical and business contexts. At all times

specific examples will be used to "ground" the theory and students will use the case study material to contribute towards the coursework assignment.

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

**MO1** Compare and evaluate intelligent and adaptive system solutions to problems of relevance to robotics

**MO2** Apply appropriate terminology and working definitions to a range of problems in intelligent and adaptive systems

**MO3** Compare the characteristics of the advanced new techniques covered in this module with traditional approaches to selected problems in signal processing, classification and control

**MO4** Design and implement intelligent and adaptive systems in given robotic applications

**Hours to be allocated:** 150

**Contact hours:**

Independent study/self-guided study = 114 hours

Face-to-face learning = 12 hours

Total = 150

**Reading list:** The reading list for this module can be accessed at [readinglists.uwe.ac.uk](https://uwe.rl.talis.com/modules/ufmf99-15-3.html) via the following link <https://uwe.rl.talis.com/modules/ufmf99-15-3.html>

## **Part 4: Assessment**

**Assessment strategy:** The assessment for this module is as follows:

A will be an end of module written examination to assess individual abilities on problem analysis and subject knowledge. The exam facilitates the assessment of the full scope of the module.

Coursework assignment that assesses practical design and implementation abilities and understanding of a chosen topic from the syllabus. There are likely aspects of the practical work that builds confidence in preparing for the exam. The coursework allows students to investigate specific areas in greater depth.

Resit strategy:

Resit is the same as the first sit

Resit deliverable(s) will be scaled appropriately to group size and task complexity

**Assessment tasks:**

**Examination (Online) (First Sit)**

Description: Online Examination (2 hours + 2 hours for submission)

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3

**Written Assignment (First Sit)**

Description: Individual report for work they have performed in a group (max. 1500 words).

Weighting: 50 %

Final assessment: No

Group work: Yes

Learning outcomes tested: MO1, MO2, MO3, MO4

**Examination (Online) (Resit)**

Description: Online Examination (2 hours + 2 hours for submission)

Weighting: 50 %

Final assessment: Yes

Group work: No

Learning outcomes tested: MO1, MO2, MO3

**Written Assignment (Resit)**

Description: Individual report for work they have performed in a group (max. 1500 words).

Resit deliverable(s) will be scaled appropriately to group size and task complexity

Weighting: 50 %

Final assessment: No

Group work: Yes

Learning outcomes tested: MO1, MO2, MO3, MO4

**Part 5: Contributes towards**

This module contributes towards the following programmes of study:

Instrumentation and Control Engineering {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2020-21

Instrumentation and Control Engineering {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2020-21

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

Automation and Robotics Engineering {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2020-21

Automation and Robotics Engineering {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2020-21

Robotics [Sep][SW][Frenchay][4yrs] BEng (Hons) 2020-21

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

Robotics {Foundation} [Sep][FT][Frenchay][4yrs] - Not Running BEng (Hons) 2020-21

Robotics [Sep][SW][Frenchay][4yrs] - Withdrawn BEng (Hons) 2020-21

Robotics {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2019-20

