Module Specification

Intelligent and Adaptive Systems

Version: 2022-23, v4.0, 07 Jun 2022

Contents

Part 1: Information

Module title: Intelligent and Adaptive Systems

Module code: UFMF99-15-3

Level: Level 6

For implementation from: 2022-23

UWE credit rating: 15

ECTS credit rating: 7.5

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: Mathematical Modelling for Electronics and Robotics 2020-21

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 via the following link https://uwe.rl.talis.com/modules/ufmf99-15-3.html

Part 4: Assessment

Assessment strategy: Component 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.

Component B will be a 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:
Component A will be a written examination.

Component B will be a written report that assesses practical design and implementation abilities and understanding of a chosen topic from the syllabus.

Assessment components:

Examination (Online) - Component A (First Sit)
Description: Online Examination (4 hours)
Weighting: 50 %
Final assessment: Yes
Group work: No
Learning outcomes tested: MO1, MO2, MO3

Written Assignment - Component B (First Sit)
Description: Each student will be expected to submit an individual report for work they have performed in a group.
Assignment (1500 words).
Weighting: 50 %
Final assessment: No
Group work: Yes
Learning outcomes tested: MO1, MO2, 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

Written Assignment - Component B (Resit)
Description: Individual submission of assignment (1500 words)
Weighting: 50 %
Final assessment: No
Group work: No
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) 2019-20

Instrumentation and Control Engineering {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2019-20

Robotics [Jan][PT][Frenchay][2yrs] MRes 2022-23

Robotics [Jan][FT][Frenchay][1yr] MRes 2022-23

Robotics [Sep][FT][Frenchay][1yr] MRes 2022-23

Robotics [Sep][PT][Frenchay][2yrs] MRes 2022-23

Robotics [Sep][PT][Frenchay][2yrs] MRes 2022-23

Robotics [Sep][FT][Frenchay][3yrs] BEng (Hons) 2020-21

Robotics [Sep][FT][Frenchay][3yrs] - Not Running BEng (Hons) 2020-21

Automation and Robotics Engineering {Foundation} [Oct][FT][GCET][4yrs] BEng (Hons) 2019-20

Automation and Robotics Engineering {Foundation} [Feb][FT][GCET][4yrs] BEng (Hons) 2019-20

Robotics [Sep][SW][Frenchay][4yrs] BEng (Hons) 2019-20

Robotics {Foundation} [Sep][FT][Frenchay][4yrs] BEng (Hons) 2019-20

Robotics {Foundation} [Sep][SW][Frenchay][5yrs] BEng (Hons) 2018-19