MODULE SPECIFICATION

Part 1: Information			
Module Title	Introduction to Artificial Intelligence		
Module Code	UFCFD3-30-1	Level	Level 4
For implementation from	2018-19		
UWE Credit Rating	30	ECTS Credit Rating	15
Faculty	Faculty of Environment & Technology	Field	Computer Science and Creative Technologies
Department	FET Dept of Computer Sci & Creative Tech		
Contributes towards	Computer Science [Sep][SW][Frenchay][4yrs] BSc (Hons) 2018-19 Games Technology [Sep][SW][Frenchay][4yrs] BSc (Hons) 2018-19 Games Technology [Sep][FT][Frenchay][3yrs] BSc (Hons) 2018-19 Computer Science [May][FT][Villa][3yrs] BSc (Hons) 2018-19 Computer Science [Jan][FT][Villa][3yrs] BSc (Hons) 2018-19 Computer Science [Sep][FT][Villa][3yrs] BSc (Hons) 2018-19 Computer Science [Sep][FT][Frenchay][3yrs] BSc (Hons) 2018-19		
Module type:	Standard		
Pre-requisites	None		
Excluded Combinations	Introductory Artificial Intelligence for Robotics 2018-19		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description
Educational Aims: In addition to the learning outcomes the educational experience may explore, develop, and practise but not formally discretely assess the following: Working as a team member IT skills in context, in particular e-learning tools Presentation skills

Outline Syllabus: 1. Introduction to Artificial Intelligence:

What we mean by Artificial Intelligence: the Turing/Searle debate; “strong vs. weak” Artificial Intelligence; Symbolic Processing vs. Computational Intelligence.
The “Black-Box” model of computer systems, and problem solving as search.
Problem types and decomposition: Pattern recognition, modelling and prediction, action selection, planning, optimisation, simulation.
Hybrid systems and the need for an appropriate choice of paradigms for different parts of a decomposed problem.
Some key technologies for different types of models e.g. Rule-sets, decision trees, multi-layer perceptrons.
Perspective of computers as Finite State Machines, statebased and hierarchical architectures for robots/agents, and their relationship to planning.

2. Search as a metaphor for learning:

Search landscapes, idea that search could be either through complete solutions, or constructive in nature. Combinatorial explosion and Global/local search heuristics.
Single member uninformed search strategies (depth/ breadth-first) and their relationship to Computer Science concepts such as queues and stacks.
Design of heuristic quality functions. Single member search (branch-and-bound, best-first, A*).
Single member heuristicbased search (hill-climbers) Illustrated for combinatorial (e.g. rule-set induction) and continuous (e.g. ANN weights) problems.
Population-based search exemplified by: Genetic Algorithm for combinatorial optimisation, Evolution Strategy for continuous domain (optimisation or models e.g. weights of ANN); Ant Colony for population-based constructive search; Genetic programming and Pittsburgh Learning Classifier System to evolve models (decision trees and rule sets respectively) and boids/flocking algorithms for simulation.

3. Symbolic Knowledge Representation:

Knowledge and meta-knowledge; production rules; logic systems; problems of knowledge acquisition. Logic and its limitations:
Logic database (statements, facts, assertions, variables and rules); inference mechanism (search strategy, backtracking); deduction and abduction.
Structure of rule-based systems. Expert systems. Domain of symbolic processing and search techniques: notion of well defined problems; state-space graphs and trees.
Modern symbolic approaches exemplified by Semantic Web.

4. Alternative forms of Knowledge Representation:

Fuzzy and Probabilistic reasoning: Fuzzy sets, hedges, fuzzy
inference engines. Naïve Bayesian Networks.
Subsymbolic: exemplified by Natural and Artificial Neural Networks. Simulation of simple neuron-like structures; neuron as a simple computing element, pattern associator; emergent properties; perceptrons; multi-layer neural networks. Back propagation and evolution as alternative learning mechanisms.
Implicit knowledge representation exemplified by instance based learning (Nearest Neighbour), Case-Based reasoning and variants.

Teaching and Learning Methods: Each numbered section of the syllabus, as detailed above, represent equal amounts of teaching.

Scheduled Learning

Materials will be introduced via lectures. Tutorials will use a mixture of group-work and individual activities to ground the materials covered in the lectures. Activities will cover a range of paper based and practical exercises. The latter will illustrate various topics within the context of developing an AI application for a game-playing scenario.

Seminars will highlight recent research and present case studies from reallife applications to

illustrate the theoretical subjects covered. As the module progresses, students will be expected to participate in group research and presentations of selected topics during these seminars.
Independent Learning

Students will be expected to learn independently by carrying out reading and directed study outside taught classes. Therefore additional materials, group activities, discussion exercises and individual practical experience of implementing and using Artificial Intelligence solutions will be delivered via Blackboard.

In addition to the tutorials, formative assessment will be provided via weekly self-assessment tests delivered via Blackboard and available throughout the course.

An assessed piece of coursework will be delivered in the form of a series of tasks which the students should complete independently and then report their findings via a Blackboard test.

There will be 72 hours contact time which will consist of lectures, tutorials and seminars.

Contact hours: 72
Assimilation and development of knowledge: 148
Exam preparation: 60
Coursework preparation: 20
Total study time: 300

Part 3: Assessment

The learning outcomes will be formally assessed in two ways. An end-of-year examination in controlled conditions will assess knowledge and understanding of the materials covered and the ability to apply the techniques studied. This will be of three hours duration, typically conducted as a Blackboard test, so that practical activities can be included and feedback can be easily and automatically provided.

Two pieces of coursework, one per semester will be used to assess the student's abilities to apply the technologies they have studied. Students will be given problems to solve, and tested on their solutions, alongside their understanding of, and the appropriateness of, the techniques utilised. Typically, where possible, the problems will be presented via an online system. Students will be required to submit write source code to solve the problems and to submit their solutions to an automated marking system. This will facilitate the provision of prompt and personalised feedback.

Weekly self-assessments tests on Blackboard will provide the students with opportunities to check their understanding of materials and receive detailed feedback.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Set Exercise - Component B		25 %	Coursework – solutions to a series of search problems
Set Exercise - Component B		25 %	Coursework – solution to a series of knowledge representation problems
Examination - Component A	✓	50 %	Examination (3 hours)
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Set Exercise - Component B		50 %	Coursework – solutions to a series of AI problems
Examination - Component A	✓	50 %	Examination (3 hours)

Part 4: Teaching and Learning Methods

Learning Outcomes

On successful completion of this module students will be able to:

	Module Learning Outcomes
MO1	Identify different types of problem (optimisation, modelling, simulation), and associated state based models
MO2	Explain the concept of learning as search, and illustrate different individual and population-based search methods
MO3	Identify different paradigms for representing problems and knowledge (e.g. symbolic, fuzzy, probabilistic and sub-symbolic), and explain their main features and differences
MO4	Formulate appropriate representations of problems and associated knowledge
MO5	Use criteria to discriminate, select and apply appropriate paradigms
MO6	Design and implement intelligent solutions using at least two different architectures
MO7	Design and implement a range of different search methods

Contact Hours

Contact Hours	
Independent Study Hours:	
Independent study/self-guided study	228
Total Independent Study Hours:	228
Scheduled Learning and Teaching Hours:	
Face-to-face learning	72
Total Scheduled Learning and Teaching Hours:	72
Hours to be allocated	300
Allocated Hours	300

Reading List

The reading list for this module can be accessed via the following link:

https://uwe.rl.talis.com/modules/ufcfd3-30-1.html