MODULE SPECIFICATION

Part 1: Information			
Module Title	Autonomous Agents and Multi-Agent Systems		
Module Code	UFCFXR-15-3	Level	Level 6
For implementation from	2022-23		
UWE Credit Rating	15	ECTS Credit Rating	7.5
Faculty	Faculty of Environment & Technology	Field	
Department	FET Dept of Computer Sci & Creative Tech		
Contributes towards	Computer Science BSc (Hons) 2020-21		
Module type:	Standard		
Pre-requisites	Artificial Intelligence I 2020-21, Principles of Programming 2020-21		
Excluded Combinations	None		
Co- requisites	None		
Module Entry requirements	None		

Part 2: Description
Autonomous agents and multi-agent systems have emerged as one of the most important computer technologies, holding out many promises for solving real-world problems. A multi-agent system is a software system composed of multiple interacting components known as agents, which are typically capable of collaborating to solve problems that no single agent could solve alone and/or to solve problems more effectively. Agents are being used in wide variety of applications that include small systems like email filtering and prioritising, IoT, and safety-critical systems to e-commerce applications. Topics include agent theories and architectures, inter-agent communication, teamwork, distributed problem solving, agent modelling, and multi-agent learning. **Educational Aims:** This module aims at introducing the basic concept of an agent and multi-agent systems, the theories and methods regarding multi-agent systems and their appropriate applications.

Outline Syllabus: Basic concepts and applications of agents: concept of an agent, agents and objects, agents and distributed systems, the design of intelligent agents, agent-environment interactions, Belief, Desire and Intentions (BDI), typical application areas of agent systems.

Multi-agent systems: concept of an multi-agent system, multi-agent interactions, cooperative and non-cooperative interactions, reasoning agents, logics of agency, interaction languages and protocols, multi-agent systems and machine learning, multi-agent systems design and development using a cutting-edge tool such as Java Agent Development Framework (JADE) platform and/or NetLogo.

Teaching and Learning Methods: Lectures will provide the theoretical underpinning to allow students to explore the potential of agent-based AI techniques to solve complex problems.

Practical sessions and tutorials will facilitate deeper understanding via activities working through the process of applying the techniques covered in the lectures to solve concrete problems. These will provide students the opportunity to work independently and learn with the support of the tutors.

Part 3: Assessment

The summative assessment strategy for this module is a combination of written examination and coursework assignment:

Component A: the written examination (2 hours) will assess the students' knowledge, understanding and application of the concepts, problems and techniques associated with autonomous agents and multi-agent systems.

Component B:
The coursework assignment assesses, via a case study, the students' application of practical skills in designing and developing an agent-based application system using a state-of-the art development framework such as JADE. Students will be required to submit a portfolio containing documents, including the system design, software code, logs of the analysis, and the expected results. Practical cases from real world problems such as design and optimisation problems, networking and communication problems etc., will be considered for the coursework.

Students will have the opportunity for formative feedback during practical lab/tutorial sessions.

First Sit Components	**Final Assessment**	**Element weighting**	**Description**
Portfolio - Component B		50 %	Portfolio containing a case study system design, software code, logs of the analysis, and the expected results.
Examination - Component A	✓	50 %	Written Examination
Resit Components	**Final Assessment**	**Element weighting**	**Description**
Portfolio - Component B		50 %	Portfolio containing a case study system design, software code, logs of the analysis, and the expected results.
Examination - Component A	✓	50 %	Examination (2 hours)

Part 4: Teaching and Learning Methods

Learning Outcomes

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

	Module Learning Outcomes
MO1	Compare and contrast agent-based paradigms with other traditional software paradigms; (assessed in Component A)
MO2	Evaluate the key issues associated with constructing agents capable of intelligent and autonomous behaviours; (assessed in Component A)
MO3	Apply new analysis and design skills and techniques, appropriate to solving more complex AI problems; (assessed in Component A+B)
MO4	Identify situations where agent-based problem analysis, system design and programming paradigms are applicable and to create software that exploits them; (assessed in Component B)
MO5	Evaluate the concepts of multi-agent systems including formation and collaboration, and develop collaborative and competitive multi agent systems to solve complex problems; (assessed in Component A+B);
MO6	Research the use of machine learning, especially reinforcement learning in building collaboration among multiple autonomous agents. (assessed in Component B)

Contact Hours

Contact Hours	
Independent Study Hours:	
Independent study/self-guided study	114
Total Independent Study Hours:	114
Scheduled Learning and Teaching Hours:	
Face-to-face learning	36
Total Scheduled Learning and Teaching Hours:	36
Hours to be allocated	150
Allocated Hours	150

Reading List

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

https://rl.talis.com/3/uwe/lists/E7CA0023-3F2F-7518-A7B0-6D5DA9BBA413.html?draft=1&lang=en-GB&login=1