Module Code:	COM722

Module Title:	Advanced Artificial Intelligence

Level:	7	Credit Value:	20

Cost Centre(s):	GACP	JACS3 **code**: HECoS code:	I600 101267

Faculty	Arts, Science and Technology	Module Leader:	Rich Hebblewhite

Scheduled learning and teaching hours	60 hrs
Guided independent study	140 hrs
Placement	0 hrs
Module duration (total hours)	200 hrs

Guidance - normally, the university would expect to see the following amounts of contact time and independent learning time for taught modules as part of its Modular Curriculum Framework;

Level	Credit volume	Overall learning hours	Contact learning hours	Independent learning hours
Level 3	20 credits	200 hrs	40	160
Level 4	20 credits	200 hrs	36	164
Level 5	20 credits	200 hrs	30	170
Level 6	20 credits	200 hrs	24	176
Level 7	20 credits	200 hrs	21	179

Programme(s) in which to be offered (not including exit awards)	Core	Option
MSc Computer Game Development	✓	☐
MSc Affective Computing	✓	☐
MComp Computer Game Development	✓	☐

Pre-requisites

Module Aims

In this module students are given the opportunity to study problem solving techniques that are applicable to artificial intelligence with the intention of providing them with the ability to develop intelligent systems. It will concentrate on areas of AI that are particularly applicable to Robotics and Computer Games.

Investigating the role of human intelligence from the Computer Science point of view will enable students to appreciate the role of problem solving. Typical techniques include identification trees, neural nets, genetic algorithms, sparse spaces, near misses particularly applicable to nearest neighbours will be studied. These techniques will enable students to tackle problems in the areas of machine learning, pattern recognition, natural language processing and understanding, perception and expert systems.

Intended Learning Outcomes

Key skills for employability

KS1	Written, oral and media communication skills
KS2	Leadership, team working and networking skills
KS3	Opportunity, creativity and problem solving skills
KS4	Information technology skills and digital literacy
KS5	Information management skills
KS6	Research skills
KS7	Intercultural and sustainability skills
KS8	Career management skills
KS9	Learning to learn (managing personal and professional development, self-management)
KS10	Numeracy

At the end of this module, students will be able to		Key Skills	
1	Make an informed judgment on knowledge representation techniques and problem solving strategies to an AI application	KS1	KS3
		KS4	KS5
		KS6	KS10
2	Design and implement an appropriate solution using AI concepts	KS1	KS3
		KS4	KS5
		KS6	KS10
3	Critically analyse the results obtained from an AI solution	KS1	KS3
		KS4	KS5
		KS6	KS10

Transferable skills and other attributes

Derogations
None

Assessment:				
Indicative Assessment Tasks:				
Indicative assessment				
There will be two equally weighted assessments.				
The first assessment will focus on the design of an AI knowledge representation and problem solving solution for either a given game or robotic related scenario.				
The final deliverable will take the form of a system prototype with an analysis of the results obtained for the techniques developed.				
Assessment number	Learning Outcomes to be met	Type of assessment	Weighting (%)	Duration or Word count (or equivalent if appropriate)
1	2, 3	Coursework	50%	2,000
2	1	Coursework	50%	2,000

Learning and Teaching Strategies:
Students will be directed using on-line material and lectures on the concepts of Human intelligence and knowledge representation applicable to AI. Directed activities and tutorial exercises will engage students in general AI techniques and concepts of computer games and robotics. Practical study and experimentation with AI techniques will enable the students to develop an AI solution.

Syllabus outline:
Analysis of the nature of creativity in humans and the applicability to, robots, computers and games. In addition, consideration of the nature of machine learning. Intelligent Robotics Autonomous Agents Agents, Knowledge and Data Machine Learning Natural Language Processing Pattern Recognition Text Technologies for Data Science Robotics: Science and Systems Human-Computer Interaction Computational Cognitive Neuroscience Advanced Vision Algorithmic Game Theory and Its Applications Computer Animation and Visualisation

Indicative Bibliography:

Essential reading

Russell, S., Norvig, P. (2016) Artificial Intelligence: A Modern Approach, Cambridge (UK), Pearson Publishing

Other indicative reading

Murphy, R.R. (2001) Introduction to AI Robotics (Intelligent Robotics & Autonomous Agents) (Intelligent Robotics & Autonomous Agents Series), Cambridge Massachusetts, MIT Press

Geraci, R.M (2012) Apocalyptic Ai: Visions Of Heaven In Robotics, Artificial Intelligence, And Virtual Reality, Oxford University Press

Champandard A.J. (2004). AI Game Development, New Riders Publishing.

Rabin, S. (2006). AI Game Programming Wisdom 3. Charles River Media.

Schwab B. (2004). AI Game Engine Programming, Charles River Media.

Thorne, M. (1993) Knowledge Representation. Artificial Intelligence Texts, Paperback Ed.

International Game Developers

Association, http://www.igda.org