University of the West of Scotland

Module Descriptor

Session: 2024/25

Title of Module: Intelligent Systems			
Code: COMP11071	**SCQF Level: 11 (Scottish Credit and Qualifications Framework)**	**Credit Points: 20**	**ECTS: 10 (European Credit Transfer Scheme)**
School:	School of Computing, Engineering and Physical Sciences		
Module Co-ordinator:	Keshav Dahal		

Summary of Module

This module covers the fundamentals of Intelligent Systems and provides the theoretical background for its most used Artificial Intelligence (AI) techniques. The module then focuses on several application case studies of these technologies in different real-life scenarios. The students learn how to apply different AI technologies for solving various practical problems and how to develop simple intelligent systems. The aim is to provide a way to train students in carrying out hands-on tasks, while developing their creative thinking and preparing them to the industrial requirements. The module will develop a range of graduate attributes. Knowledge in the principles behind the Artificial Intelligence techniques will develop skills of critically evaluating the generalised AI methods for specific applications of intelligent systems. The students will gain a systematic understanding of the characteristics, feasibility and the supporting mathematics of commonly used AI approaches and their application in intelligent systems. This module provides a way to train students in carrying out hands-on tasks, while developing their creative thinking and preparing them for future employment.

Outline Syllabus:

1. Introduction to Intelligent systems and AI.
2. Expert Systems. Expert System Case Studies.
3. Search strategies, Heuristics, Traveling Salesman Problem (TSP) examples, Case studies.
4. Fuzzy Sets and Systems: Fuzzy Sets. Fuzzy Variables. Fuzzy Implications and Reasoning. Fuzzy Inference Systems. Implementations. Application Case Studies.
5. Evolutionary computation techniques: Genetic Algorithms. Genetic operators. Implementations. Application Case Studies.
6. Artificial Neural Networks: Perceptron Learning Rule. Sigmoid functions. Back-propagation. Supervised Learning. Unsupervised Learning. Neural Net Implementations. Application Case Studies.

Module Delivery Method

Face-To-Face	Blended	Fully Online	HybridC	Hybrid 0	Work-Based Learning
☒	☒	☐	☐	☐	☐
See Guidance Note for details.					

Campus(es) for Module Delivery						
The module will **normally** be offered on the following campuses / or by Distance/Online Learning: (Provided viable student numbers permit) (tick as appropriate)						
Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
☒	☐	☐	☐	☐	☐	Add name

Term(s) for Module Delivery					
(Provided viable student numbers permit).					
Term 1	☐	Term 2	☒	Term 3	☐

Learning Outcomes: (maximum of 5 statements) **These should take cognisance of the SCQF level descriptors and be at the appropriate level for the module.** At the end of this module, the student will be able to:	
L1	Analyse the need for, and effectiveness of, various artificial intelligence (AI) techniques for data analysis and intelligent optimisation process;
L2	Evaluate and implement simple intelligent systems applied to specific real-life problems both systematically and creatively;
L3	Demonstrate abilities to build simple versions of AI applications and familiarity with full-scale versions of AI applications

Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	During completion of this module, there will be an opportunity to achieve core skills in:
Knowledge and Understanding (K and U)	SCQF Level **11** Knowledge & understanding of working principle of common AI techniques. Mastery of fundamental ideas and techniques of AI.

Practice: Applied Knowledge and Understanding	SCQF Level **11** Knowledge of practical skills to apply basic theoretical concepts to design and implementation of simple intelligent systems.	
Generic Cognitive skills	SCQF Level **11** Students will develop ability to critically examine and appreciate the central issues in the main sub-areas of AI and ability to apply AI techniques.	
Communication, ICT and Numeracy Skills	SCQF Level **11** Compiling individual report students will develop communication skills as well as the ability to write technical report. Students will gain a systematic understanding supporting mathematics of AI techniques.	
Autonomy, Accountability and Working with others	SCQF Level **11** Students will be encouraged to work with others in tutorials and lab sessions for finding information and solving problems on the assigned task. In doing so, students will develop a sense of accountability to the other members.	
Pre-requisites:	Before undertaking this module the student should have undertaken the following:	
	Module Code:	**Module Title:**
	Other:	
Co-requisites	**Module Code:**	**Module Title:**

*Indicates that module descriptor is not published.

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Student Learning Hours** (Normally totalling 200 hours): (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture/Core Content Delivery	20
Tutorial/Synchronous Support Activity	

Laboratory/Practical Demonstration/Workshop	20
Independent Study	160
	200 Hours Total

****Indicative Resources: (eg. Core text, journals, internet access)**

The following materials form essential underpinning for the module content and ultimately for the learning outcomes:

• Module Resources on Aula/Moodle

• Octave/MATLAB with Neural network, fuzzy toolbox and GA tool box

• The World Wide Web

• Artificial Intelligence: A Guide to Intelligent Systems (3rd Edition), Michael Negnevitsky, Pearson, 2011.

• Artificial Intelligence & Data Mining Applications in the E&P Industry (Digital Edition), Shahab D. Mohaghegh, Saud Al-Fattah and Andrei Popa, Society of Petroleum Engineers (SPE) – 2011.

• Research articles.

(**N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance and Engagement Requirements

In line with the Student Attendance and Engagement Procedure: Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time.

Equality and Diversity

The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: UWS Equality, Diversity and Human Rights Code.

Please ensure any specific requirements are detailed in this section. Module Co-ordinators should consider the accessibility of their module for groups with protected characteristics..

(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	Computing
Assessment Results (Pass/Fail)	Yes ☐No ☒
School Assessment Board	Business & Applied Computing
Moderator	Bikrant Koirala
External Examiner	Chunbo Luo
Accreditation Details	e.g. ACCA Click or tap here to enter text.
Changes/Version Number	2.05

Assessment: (also refer to Assessment Outcomes Grids below)
Practical Coursework (50%) Three components of formal written reports (weighted 50%) with lab implementation will be required from each student summarizing their finding on the course topics – agreed by the module coordinator, to evaluate LO3. This will test their level of understanding about the theoretical concepts, methodologies, and case studies discussed during the lectures and tutorials. These formal written reports must be submitted before the due dates.
A Formal Adapted Examination (50%) Students will be required to take a formal written/adapted examination (weighted 50%). The exam will comprise questions (Multiple choice, descriptive and numerical problem solving). Questions will mainly assess student's understanding about the theoretical topics covered in the lectures, to evaluate LO1 and LO2.
(N.B. (i) **Assessment Outcomes Grids** for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed. (ii) An **indicative schedule** listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)

Assessment Outcome Grids (See Guidance Note)

	Component 1					
Assessment Type (Footnote B.)	**Learning Outcome (1)**	**Learning Outcome (2)**	**Learning Outcome (3)**	**Learning Outcome (4)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**
Unseen closed book Exam (standard)	✓	✓			50	2

	Component 2					
Assessment Type (Footnote B.)	**Learning Outcome (1)**	**Learning Outcome (2)**	**Learning Outcome (3)**	**Learning Outcome (4)**	**Weighting (%) of Assessment Element**	**Timetabled Contact Hours**
Report of practical/ field/ clinical work			✓		50	8
Combined Total for All Components					**100%**	**10 hours**

Change Control:

What	When	Who

Version Number: MD Template 1 (2023-24)