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**	**HybridO**	**Work-based Learning**
✓	✓				

Face-To-Face
Term used to describe the traditional classroom environment where the students and the lecturer meet synchronously in the same room for the whole provision.
Blended
A mode of delivery of a module or a programme that involves online and face-to-face delivery of learning, teaching and assessment activities, student support and feedback. A programme may be considered "blended" if it includes a combination of face-to-face, online and blended modules. If an online programme has any compulsory face-to-face and campus elements it must be described as blended with clearly articulated delivery information to manage student expectations
Fully Online
Instruction that is solely delivered by web-based or internet-based technologies. This term is used to describe the previously used terms distance learning and e learning.

<table>
<tr><td>
HybridC
Online with mandatory face-to-face learning on Campus
HybridO
Online with optional face-to-face learning on Campus
Work-based Learning
Learning activities where the main location for the learning experience is in the workplace.
</td></tr>
</table>

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)

Paisley:	Ayr:	Dumfries:	Lanarkshire:	London:	Distance/Online Learning:	Other:
✓						

Term(s) for Module Delivery

(Provided viable student numbers permit).

Term 1		Term 2	✓	Term 3	

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Learning Outcomes: (maximum of 5 statements)

On successful completion of this module the student will be able to:
L1. LO1: Analyse the need for, and effectiveness of, various artificial intelligence (AI) techniques for data analysis and intelligent optimisation process.
L2. LO2: Evaluate and implement simple intelligent systems applied to specific real-life problems both systematically and creatively.
L3. LO3: 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,	SCQF Level 11.

Accountability and Working with others	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.

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Learning and Teaching	
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	24
Laboratory/Practical Demonstration/Workshop	24
Independent Study	152
	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)	

Engagement Requirements
In line with the Academic Engagement Procedure, Students are defined as academically engaged if they are regularly engaged with timetabled teaching sessions, course-related learning resources including those in the Library and on the relevant learning platform, and complete assessments and submit these on time. Please refer to the Academic Engagement Procedure at the following link: **Academic engagement procedure**

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Supplemental Information

Programme Board	Computing
Assessment Results (Pass/Fail)	No
Subject Panel	Business & Applied Computing
Moderator	Zeeshan Pervez
External Examiner	C Luo
Accreditation Details	
Version Number	2.04

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Assessment: (also refer to Assessment Outcomes Grids below)
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.
Three/Four 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.
(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 Handbook.)

Assessment Outcome Grids (Footnote A.)

Component 1

Assessment Type (Footnote B.)	Learning Outcome (1)	Learning Outcome (2)	Learning Outcome (3)	Weighting (%) of Assessment Element	Timetabled Contact Hours	
Unseen closed book (standard)	✓	✓		0	0	

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

Footnotes

A. Referred to within Assessment Section above

B. Identified in the Learning Outcome Section above

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Note(s):
1. More than one assessment method can be used to assess individual learning outcomes.
2. Schools are responsible for determining student contact hours. Please refer to University Policy on contact hours (extract contained within section 10 of the Module Descriptor guidance note). This will normally be variable across Schools, dependent on Programmes &/or Professional requirements.

Equality and Diversity
This module is suitable for any student. The assessment regime will be applied flexibly so that a student who can attain the practical outcomes of the module will not be disadvantaged. When a student discloses a disability, or if a tutor is concerned about a student, the tutor in consultation with the School Enabling Support co-ordinator will agree the appropriate adjustments to be made.   (N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School.)   UWS Equality and Diversity Policy
(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)