MODULE ARTIFICIAL INTELLIGENCE

CODE	BSCH-4-2-09	
STAGE	IV	
NUMBER OF CREDITS	4 semester credits / 6 quarter units	
STATUS	ELECTIVE	
THEME	Business Solutions & Design	
ASSESSMENT	Continuous Assessment	30%
	Examination	70%

Aims

The purpose of this module is to give the student an in-depth understanding of Artificial Intelligence methodologies, techniques, tools and results. Students will learn the theoretical and conceptual components of this discipline (from both symbolic and subsymbolic perspectives) and firm up their understanding by using at least one AI-language (such as LISP or Prolog) in laboratory assignments.

Learning Outcomes

Upon completion of this module, a student will be able to:

- Identify and discuss the major challenges facing AI, the complexity of typical problems within AI, and the current research trends within AI.
- Recognise when AI techniques are necessary to solve a problem.
- Explain the principal techniques used in implementing machine learning.
- Describe the operation of neural networks and fuzzy logic.
- Become competent in natural language processing and computer vision.
- Be capable of implementing basic Artificial Intelligence algorithms in an AI programming language.

Indicative Content

Topic	Description
Introduction to Artificial Intelligence	Definitions of intelligence and artificial intelligence; Approaches to AI; Applications of AI; Formal Systems

Predicate Calculus Review	Predicate Calculus as a knowledge representation technique; Reasoning with predicate calculus; Resolution;
Non-monotonic Logic	Limitations of First Order Predicate Logic; Plausible inference; Default logic;
Machine Learning	Difficulties of machine learning; Learning by rote; Learning by instruction; Analytic learning; Learning by induction – generalisation, specialisation; Learning programmes – Winston's blocksworld, Version Spaces;
Computer Vision	Human vision - human visual system; Marr's Framework – underlying physical assumptions, gray-level images to primal sketch, convolution with Gaussians, convolution with masks, seeing the world in depth;
Artificial Neural Networks	Biological foundations – neurons; Perceptrons – structure, similarities to neuron, Hebb Rule. linear separability, convergence theorem; Multi-layered neurons – backpropagation, delta rule. ADALINE network; Cascade Correlation;
Evolutionary Computing	Social and Emergent systems – evolutionary computing; Biological terms – chromosomes, crossover, mutation, elitism; Society-based learning – Game of Life, Cellular Automata;
Natural Language Processing	Difficulties of representing natural language; Levels of natural language analysis – prosody, phonetics, morphology, syntax, semantics, pragmatics, world knowledge; Syntax – languages, grammars, grammar types, parsing strategies; Semantics – referential, representational and social theories of meaning;

Teaching and Learning Methods

The module will be taught using a combination of lectures, tutorials and practical laboratory sessions. Practical sessions will be based on implementing some of the artificial intelligence methods and applications encountered in class in an AI-language such as Prolog or LISP. A number of graded assignments will also be given as part of the course.

Assessment Methods

Assessment will use both a continuous component and an end of semester examination. The continuous assessment component is used to develop both practical understanding and skills of artificial intelligence applications, as well as an ability to research significant fields in the area.

Primary Reading List

Title	Author	Publisher
Artificial Intelligence: A Modern Approach	Russell, Stuart and Peter Norvig	Prentice Hall 2003

Recommended Reading List

Title	Author	Publisher
Artificial Intelligence (2nd edition)	Rich, Elaine and Kevin Knight	Mc-Graw Hill, 1991
Artificial Intelligence: Structures and Strategies for Complex Problem Solving	Luger, George and William Stubblefield	Benjamin Cummings, 1997
Prolog Programming for Artificial Intelligence (3rd edition)	Ivan Bratko	Longman 2000
The Little Schemer	Sussman, Gerald, Friedman, Daniel, and Matthias Felleisen	MIT Press 1996