F20BC Biologically Inspired Computation

COURSE DETAILS
Course Code: F20BC
Full Course Title: Biologically Inspired Computation
SCQF Level: 10
SCAF Credits: 15
Available as Elective: No

DELIVERY LEVEL
Undergraduate: Yes  Postgraduate Taught: No  Postgraduate Research: No
Additional Information:

COURSE AIMS

Traditional computation finds it either difficult or impossible to perform a certain key range of tasks associated with pattern recognition, problem solving and autonomous intelligence. Great progress towards designing software for such tasks has emerged by taking inspiration from a range of natural, mainly biological, systems.

The aims of this course are to:

• introduce an appreciation of the former
• introduce the main biologically-inspired algorithms and techniques which are now commonly researched and applied
• establish a practical understanding of the real-world problems to which these techniques may be fruitfully be applied.

LEARNING OUTCOMES – SUBJECT MASTERY

• Understanding of limitations of traditional computation.
• A critical understanding of the two most common biologically inspired computation methods, their limitations and areas of applicability.
• Understanding of how to apply one or more biologically inspired techniques in solving a practical problem.

LEARNING OUTCOMES – PERSONAL ABILITIES

• Identify approaches that can be used to apply bio-inspired methods to existing problems in optimisation and machine learning.
• Exercise reasonable levels of initiative in working with a bio-inspired method (courseworks) (PDP)
• Demonstrate a degree of critical reflection in assessing the performance of a bio-inspired method (courseworks) (PDP).

SYLLABUS

• Classical vs. Biologically-inspired computation,
• evolutionary algorithms (basic EA design, and how they are applied to a wide range of problems)
F20BC Biologically Inspired Computation

- swarm intelligence (ant colony methods, particle swarm optimisation)
- neural computation (perceptrons, multilayer perceptrons, associative networks)
- cellular automata

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