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| **Module Title**<br>**Adaptive Intelligent Systems**<br><br>**Keywords**<br>Evolutionary algorithms, machine learning, optimisation, adaptive systems, artificial intelligence, naturally-inspired computing | Reference CMM508<br>SCQF SCQF<br>Level 11<br>SCQF Points 15<br>ECTS Points 7.5<br>Created May 2002<br>Approved July 2008<br>Amended September 2012<br>Version No. 2 |

# This Version is No Longer Current

The latest version of this module is available here

## Prerequisites for Module

30 credits of O-O programming or equivalent.

## Corequisite Modules

None.

## Precluded Modules

None.

## Aims of Module

To enable the student to explore the key concepts of adaptive intelligent systems. To enable the student to understand how adaptive intelligent systems can be applied to real-world applications. To enable the student to design and develop such systems.

## Indicative Student Workload

| *Contact Hours* | Full Time |
|---|---|
| Assessment | 3 |
| Laboratories | 24 |
| Lectures | 12 |
| Tutorials | 12 |
| *Directed Study* | |
| Assessment | 15 |
| Directed reading | 39 |
| *Private Study* | |
| Private Study | 45 |

## Mode of Delivery

Key concepts are introduced and illustrated through the medium of lectures. These are reinforced in tutorial classes. Laboratory sessions provide a series of exercises designed to develop proficiency in techniques essential to the development of adaptive intelligent

**Learning Outcomes for Module**

On completion of this module, students are expected to be able to:

1. Formulate and analyse problems in optimisation and machine learning and select suitable solution techniques.
2. Design and implement an adaptive intelligent system for a given application.
3. Understand and discuss current application areas of adaptive intelligent systems.
4. Understand and discuss current selected research topics in adaptive intelligent systems

**Indicative Module Content**

Techniques: evolutionary algorithms (GA, EDA, PSO, ACO), local search, constraint satisfaction and optimisation. Applications: function optimisation, artificial life, network analysis, biology and medicine, neural networks, image analysis, engineering, evolutionary art and music. Parameter tuning. Theory: exploration v exploitation, local and global optima, satisfaction and optimisation, premature convergence, plateauing, systems.

**Assessment Plan**

| | Learning Outcomes Assessed |
|---|---|
| Component 1 | 1,2,3,4 |
| Component 2 | 1,2 |

Component 1 - This is a closed book examination.

Component 2 - Coursework.

**Indicative Bibliography**


1. ASHLOCK, D. Evolutionary Computation for Modeling andOptimization, Springer 2010
2. HAUPT R.L., HAUPT S.E., Practical Genetic Algorithms (Second Edition), Wiley 2004.
3. MICHALEWICZ, Z., Schmidt M.,2006. MICHALEWICZ, M., Chiriac C., Adaptive Business Intelligence, Springer-Verlag. 2006
4. DORIGO M., STUTZLE T., 2004. Ant Colony Optimization, MIT Press.
5. ENGELBRECHT A.P., 2007. Computational Intelligence: An Introduction, Wiley-Blackwell.
6. KORDON, A. Applying Computational Intelligence: How to create Value, Springer, 2010.

Schema Theorem. Practical: problem representations, selection, genetic operators, parameter choices, evaluation and tuning of algorithms, toolkits, real world case studies in scientific optimisation, medicine, engineering and industry.