1. KentVision Code and title of the module

COMP8370 - Natural Computation

1. Division and School/Department or partner institution which will be responsible for management of the module

Division of Computing, Engineering and Mathematical Sciences

School of Computing

1. The level of the module (Level 4, Level 5, Level 6 or Level 7)

Level 7

1. The number of credits and the ECTS value which the module represents

15 credits (7.5 ECTS)

1. Which term(s) the module is to be taught in (or other teaching pattern)

Autumn or Spring

1. Prerequisite and co-requisite modules and/or any module restrictions

An Honours degree in a computing, scientific, engineering, mathematical or other numerate discipline.

1. The course(s) of study to which the module contributes

Compulsory to the following courses:

MSc Computer Science (Artificial Intelligence) with and without Year in Industry

MSc Artificial Intelligence with and without Year in Industry

Optional to the following courses:

MSc Computer Science with and without Year in Industry

MSc Computer Science (Cyber Security) with and without Year in Industry

MSc Advanced Computer Science with and without Year in Industry

MSc Cyber Security with and without Year in Industry

MSc Networks and Security with and without Year in Industry

1. The intended subject specific learning outcomes.
On successfully completing the module students will be able to:

## 8.1 describe what is meant by a natural computation paradigm, list a number of natural computing paradigms and give a brief description of each together with some examples of their (actual or potential) applications.

## 8.2 select the appropriate technique for a particular problem from a set of problem-solving heuristics based on these natural computing paradigms, and to be able to justify this choice based on a knowledge of the properties and potential of these methods.

## 8.3 analyse phenomena from the natural world from the point of view of their being computational systems. To be able to take these phenomena and distinguish between the features which are important for computational problem solving and those that are merely a fact of their realization in the natural world.

## 8.4 exploit library and online resources to support investigations into these areas.

## 8.5 critically evaluate advanced natural computation techniques based on current research.

## 8.6 have a comprehensive understanding on how to design natural computational techniques for addressing specific characteristics of a particular complex optimisation problem.

1. The intended generic learning outcomes.

On successfully completing the module students will be able to:

## 9.1 write coherently and critically about the topics studied in the course, based on readings from the scientific literature and demonstrating an awareness of how to write in a scientific manner.

## 9.2 apply mathematical techniques where appropriate.

## 9.3 apply appropriate scientific principles and methodology.

## 9.4 study independently and apply principles and techniques used in the course to new examples.

9.5 demonstrate originality in the application of knowledge while solving complex problems

9.6 critically evaluate current research

1. A synopsis of the curriculum

## There is an increasing use of nature-inspired computational techniques in computer science. These include the use of biology as a source of inspiration for solving computational problems, such as developments in evolutionary algorithms and swarm intelligence. Similarly, there is now also an increasing interest in understanding how biological, chemical and other natural systems compute, and how this could be exploited for practical applications. It is therefore proposed to allow students the opportunity to become exposed to these types of methods for use in their later careers.

1. Reading list

## The University is committed to ensuring that core reading materials are in accessible electronic format in line with the Kent Inclusive Practices.

## The most up to date reading list for each module can be found on the university’s [reading list pages](https://kent.rl.talis.com/index.html).

Eiben, AE, Smith, JE. (2015) Introduction to Evolutionary Computing, 2nd Edition. Springer.

Dorigo, M. and Stutzle, T. (2004) Ant Colony Optimization, MIT Press.

Barnes, DJ, Chu, D. (2010) Introduction to Modeling for Biosciences, Springer

1. Contact Hours

Private Study: 128

Contact Hours: 22

Total: 150

1. Assessment methods
	1. Main assessment methods

Time limited assessment (about 15 hours) (20%)

One short essay (about 1,000 words) (20%)

Examination (60%)

* 1. Reassessment methods

Like for like.

## Map of module learning outcomes (sections 9 & 10) to learning and teaching methods (section 13) and methods of assessment (section 14)

**Module learning outcomes against learning and teaching methods:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Module learning outcome** | *8.1* | *8.2* | *8.3* | *8.4* | *8.5* | *8.6* | *9.1* | *9.2* | *9.3* | *9.4* | *9.5* | *9.6* |
| Lectures | X | X | X | X | X | X | X | X | X | X | X | X |
| Private study | X | X | X | X | X | X | X | X | X | X | X | X |

**Module learning outcomes against assessment methods:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Module learning outcome** | *8.1* | *8.2* | *8.3* | *8.4* | *8.5* | *8.6* | *9.1* | *9.2* | *9.3* | *9.4* | *9.5* | *9.6* |
| Take-home computer test | X | X | X | X | X | X |  | X | X | X | X |  |
| Short essay | X | X | X | X | X | X | X |  | X |  |  | X |
| Examination | X | X | X |  | X | X | X | X | X | X | X | X |

1. Inclusive module design

The Division recognises and has embedded the expectations of current equality legislation, by ensuring that the module is as accessible as possible by design. Additional alternative arrangements for students with Inclusive Learning Plans (ILPs)/declared disabilities will be made on an individual basis, in consultation with the relevant policies and support services.

The inclusive practices in the guidance (see Annex B Appendix A) have been considered in order to support all students in the following areas:

a) Accessible resources and curriculum

b) Learning, teaching and assessment methods

1. Campus(es) or centre(s) where module will be delivered

Canterbury

1. Internationalisation

The topics addressed by this module relate to a field which is of international importance, given the global role of computers in today's technological innovation. The topics covered by this module are international in nature, being identical worldwide and independent of traditional spoken language.

**DIVISIONAL USE ONLY**

**Module record – all revisions must be recorded in the grid and full details of the change retained in the appropriate committee records.**

| Date approved | New/Major/minor revision | Start date of delivery of (revised) version | Section revised(if applicable) | Impacts PLOs (Q6&7 cover sheet) |
| --- | --- | --- | --- | --- |
| 20/06/2022 | Major | Autumn 2022 | 4, 8, 9, 10, 13 & 14 |  |
|  |  |  |  |  |