1. **Title of the module**

COMP6560 (CO656) – Computational Intelligence in Business, Economics and Finance

1. **Division or partner institution which will be responsible for management of the module**

Division of Computing, Engineering, Mathematical Sciences (CEMS)

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

Level 6

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

1. **Prerequisite and co-requisite modules**

COMP3200 Introduction to Object-Oriented Programming

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

BSc Computing, BSc Computing (Consultancy)

BSc Business Information Technology

BSc Computer Science and variants

BSc Software Engineering

BSc Artificial Intelligence

plus the “Year in Industry” versions of these courses

1. **The intended subject specific learning outcomes.
On successfully completing the module students will be able to:**
	1. Understand the concept of Computational Intelligence and its relationship to real-world problems [B1, C2, C11]
	2. Give a description of different CI algorithms with some examples of their applications [B2, C2, C10, C11, D2]
	3. Identify strategies for the design, implementation and evaluation of a CI system to a given business problem [A4, B3, B5, C1, C2, C9, D3]
	4. Present and deliver innovative solutions to a range of real-world problems from the fields of business, economics and finance [C11, D2, D3, D5]
	5. Implement a basic genetic algorithm on the computer, and apply this program to different business problems [A2, A5, B1, C1, D3]
2. **The intended generic learning outcomes.
On successfully completing the module students will be able to:**
	1. Demonstrate an understanding of theory and be able to deploy it in design, implementation, information management and evaluation of computer based systems [B7, C3]
	2. Demonstrate effective use of general IT facilities [D3]
	3. Be able to exploit library and online resources to support investigations into the relevant problem areas [D3]
	4. Be able to 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 [C2, D3]
	5. Be able to apply appropriate computer programming techniques [A2, C1]
	6. Be able to apply appropriate scientific principles and methodology [C2]
	7. Show communication skills in delivering messages to a range of audiences about technical problems and their solutions [B2, C11, D2]
3. **A synopsis of the curriculum**

The following is indicative of topics/themes this module will include:

* An overview of basic concepts related to Computational Intelligence (CI) techniques, such as heuristic search and optimisation
* Presentation of different CI algorithms, such as hill climbing, simulated annealing, genetic algorithms and genetic programming
* An overview of basic concepts related to real-world problems related to business, economics and finance, such as financial forecasting, automated bargaining, portfolio optimisation, and timetabling
* The use of Computational Intelligence techniques to solve real-world problems
* Computational Intelligence decision support systems and software wind tunnels for testing new markets and strategies
1. **Reading list (Indicative list, current at time of publication. Reading lists will be published annually)**

Bentley, P. (2002). *Digital Biology*. Hodder-Headline.
Brabazon, A. O’Neill, M. (2006). *Biologically inspired algorithms for Financial Modelling*. Springer-Verlag.
De Jong, K. (2006). *Evolutionary Computation: A Unified Approach*. MIT Press.
Gendreau, M., Ptovin, J.-Y. (Eds.) (2010). *Handbook of Metaheuristics*, International Series in Operations Research & Management, Vol. 146, Second Edition.
Gil-Lafuente, A., Merigo, J. (Eds) (2010). *Computational Intelligence in Business and Economics*, Proceedings of the MS’10 International Conference, World Scientific Proceedings Series on Computer Engineering and Information Science, Volume 3.
Goldberg, D. (1989). *Genetic Algorithms in Search, Optimization & Machine Learning*. Addison Wesley.
Koza, J. (1992). *Genetic Programming: On the Programming of Computers by Means of Natural Selection*. A Bradford Book, volume 1.
Mitchell, M. (1998). *An Introduction to Genetic Algorithms (Complex Adaptive Systems)*, A Bradford Book, Third Edition.
Poli, R., Langdon, W.B., McPhee, N.F. *A Field Guide to Genetic Programming*. Available at: <http://www.gp-field-guide.org.uk>
Papadimitriou, C., Steiglitz, K. (1998). *Combinatorial Optimization: Algorithms and Complexity*. Dover Publications.
Wang, P. (Ed.) (2004). *Computational Intelligence in Economics and Finance*. Springer.

1. **Learning and teaching methods**

Total contact hours: 33 hours

Private study hours: 117 hours

Total study hours: 150 hours

1. **Assessment methods**
	1. Main assessment methods

3 courseworks (40 hours total) ( 50%)

2 hour unseen written examination (50%)

13.2 Reassessment methods

Like for like.

1. ***Map of module learning outcomes (sections 8 & 9) to learning and teaching methods (section12) and methods of assessment (section 13)***

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Module learning outcome** | *8.1* | *8.2* | *8.3* | *8.4* | *8.5* | *9.1* | *9.2* | *9.3* | *9.4* | *9.5* | *9.6* | *9.7* |
| **Learning/ teaching method** |  |  |  |  |  |  |  |  |  |  |  |  |
| **Private Study** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Lectures** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| **Assessment method** |  |  |  |  |  |  |  |  |  |  |  |  |
| Coursework | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| Exam | **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**

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
| 23/11/2020 | Minor | September 2021 | 6, 7, 16 | No |
|  |  |  |  |  |