Confirmation that this version of the module specification has been approved by the School Learning and Teaching Committee:

…17 February 2015……………………………………………….(date)

**SECTION 1: MODULE SPECIFICATIONS**

1. Title of the module

CO656 Computational Intelligence in Business, Economics and Finance

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

School of Computing

1. Start date of the module

September 2015

1. The number of students expected to take the module

20

1. Modules to be withdrawn on the introduction of this proposed module and consultation with other relevant Schools and Faculties regarding the withdrawal

None

1. The level of the module

Honours [H]

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

15 (7.5 ECTS credits)

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

Autumn

1. Prerequisite module

CO320 Introduction to Object-Oriented Programming

1. The programmes of study to which the module contributes

BSc Computing, BSc Computing (Consultancy)

BSc Business Information Technology

Plus the year in industry versions of these programs

1. The intended subject specific learning outcomes

The aim of this module is to explore the synergy between Computational Intelligence (CI) methods and business, economics and finance. It starts by providing an opportunity for students to learn about important algorithms from the field of Computational Intelligence (CI). Then, students will be exposed to common real-world problems from the fields of business, economics and finance. Lastly, the students will learn how they can apply CI algorithms to solve real-world problems from above three areas.

*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]

1. 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]

1. A synopsis of the curriculum

* 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. Indicative Reading List
   1. Gendreau, M., Ptovin, J.-Y. (Eds.): “Handbook of Metaheuristics”, International Series in Operations Research & Management, Vol. 146, Second Edition (2010)
   2. Mitchell, M.: “An Introduction to Genetic Algorithms (Complex Adaptive Systems)”, A Bradford Book ,Third Edition (1998)
   3. De Jong, K.: “Evolutionary Computation: A Unified Approach”, MIT Press (2006)
   4. Goldberg, D.: “Genetic Algorithms in Search, Optimization & Machine Learning”, Addison Wesley (1989)
   5. Koza, J.: “Genetic Programming: On the Programming of Computers by Means of Natural Selection”, A Bradford Book, volume 1 (1992)
   6. Poli, R., Langdon, W.B., McPhee, N.F.: “A Field Guide to Genetic Programming”. Available at: http://www.gp-field-guide.org.uk
   7. Bentley, P.: “Digital Biology”, Hodder-Headline (2002)
   8. Papadimitriou, C., Steiglitz, K.: “Combinatorial Optimization: Algorithms and Complexity”, Dover Publications (1998)
   9. Brabazon, A. O’Neill, M.: “Biologically inspired algorithms for Financial Modelling”, Springer-Verlag (2006)
   10. Gil-Lafuente, A., Merigo, J. (Eds): “ 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 (2010)
   11. Wang, P. (Ed.): “Computational Intelligence in Economics and Finance”, Springer (2004)
2. Learning and Teaching Methods, including the nature and number of contact hours and the total study hours which will be expected of students, and how these relate to achievement of the intended module learning outcomes

Learning and Teaching Methods:

* 22 hours of lectures [11.1 – 11.4] [12.1 – 12.2, 12.4 – 12.6]
* 11 hours of supervised practical classes (computing sessions) [11.1 – 11.5] [12.1 – 12.6]
* 42 hours of coursework [11.1 – 11.5] [12.1 – 12.7]
* 75 hours of private study [11.1 – 11.5] [12.1 - 12.6]

Total Study Hours: 150

1. Assessment methods and how these relate to testing achievement of the intended module learning outcomes

This module will be assessed by 50% coursework and 50% examination

* 50% coursework
* Task 1: Implementation of a real-world problem from the field of business, economics and finance. This represents 20% of the final mark. Assesses [11.1, 11.4] and [12.1 – 12.5]
* Task 2: Application of a Genetic Algorithm (GA) to solve the real world problem of Task 2. This represents 20% of the final mark. Assesses [11.1 – 11.5] and [12.1 – 12.6]
* Task 3: PowerPoint presentation. Students should present how they modelled the problem from Task 1 and how they applied the GA in Task 2 to solve it. This represents 10% of the final mark. Assesses [11.1 – 11.4] and [12.1 – 12.4, 12.6 – 12.7]
* 50% 2 hour written examination

Examination questions will be set to ensure that a range of learning outcomes is covered [11.1 – 11.3] [12.1, 12.4]

1. Implications for learning resources, including staff, library, IT and space

No additional IT facilities required. Items 14.1, 14.3, 14.7, 14.9, 14.10 and 14.11 from the Reading list are not available in the library, and will be acquired.

1. The School recognises and has embedded the expectations of current disability equality legislation, and supports students with a declared disability or special educational need in its teaching. Within this module we will make reasonable adjustments wherever necessary, including additional or substitute materials, teaching modes or assessment methods for students who have declared and discussed their learning support needs. Arrangements for students with declared disabilities will be made on an individual basis, in consultation with the University’s disability/dyslexia support service, and specialist support will be provided where needed.
2. Campus(es) where module will be delivered:

Medway

*I****f the module is part of a programme in a Partner College or Validated Institution, please complete the following:***

1. Partner College/Validated Institution:
2. University School responsible for the programme: