Computational Thinking with Algorithms

Module Description
A comprehensive grounding in solving computational problems and designing algorithms.

Learning Outcomes
On completion of this module the learner will/should be able to:

1. Apply structured methodologies to problem solving in computing.
2. Design algorithms to solve computational problems.
3. Critically evaluate and assess the performance of algorithms.
4. Translate real-world problems into computational problems.

Indicative Syllabus

Computational Thinking
- Understanding and describing problems
- Modelling real-world problems
- Abstraction and experimentation
- Undecidable problems

Algorithm design
- Searching
- Sorting
- Data structures
- Flow diagrams

Analysis of Algorithms
- Sizing a problem
- Rates of growth
- Best, average and worst cases
- Benchmarks

Using the literature
- Accessing the literature
- Reading the work of others
- Writing literature

Teaching and Learning Strategy
A combination of lectures and practical sessions will be provided.

Assessment Strategy
Students will be assessed through a combination of assignments and projects.

Repeat Assessment Strategies

A large project will be provided covering all learning outcomes.

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<th>Indicative Coursework and Continuous Assessment:</th>
<th>100 %</th>
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<td>Written Report</td>
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<td>Project</td>
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<th>Full Time Delivery Mode Average Weekly Workload:</th>
<th>4.00 Hours</th>
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<tr>
<td>Lecture</td>
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<td>Practical</td>
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<td>Online (Synchronous)</td>
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Literary Resources

- **Algorithmics - The Spirit of Computing - 3rd Edition**
  David Harel & Yishai Feldman
  Springer

- **Algorithms in a Nutshell**
  George T. Heineman, Gary Pollice, and Stanley Selkow
  O’ Reilly

- **Data Structures and Algorithms in Java - (4th edition)**
  Michael T. Goodrich and Roberto Tamassia
  John Wiley & Sons Inc.

Online Resources

http://csunplugged.org/

Other Resources

None.

Additional Information

None.

Programme Membership

- GA_KDATG_L08 201700 Higher Diploma in Science in Data Analytics
- GA_KSOFG_L08 201700 Higher Diploma in Science in Software Development