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## MODULE DESCRIPTOR

### Module Title

Advanced Digital System Design

|           |               |             |         |
|-----------|---------------|-------------|---------|
| Reference | EN4542        | Version     | 3       |
| Created   | February 2018 | SCQF Level  | SCQF 10 |
| Approved  |               | SCQF Points | 15      |
| Amended   | March 2018    | ECTS Points | 7.5     |

### Aims of Module

To enable student to study the advanced techniques and methods for digital systems and to provide students with the ability to analyse, design an implement advanced digital systems.

### Learning Outcomes for Module

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

- 1 Design, implement and evaluate the performance of digital systems.
- 2 Analyse and critically assess the design of advanced digital systems.
- 3 Synthesise solutions to engineering problems using computational intelligence based digital systems.
- 4 Analyse and evaluate solutions of computational intelligence based digital systems using computer simulation.

### Indicative Module Content

Advanced techniques for processor design: pipelined processors, very long instruction word (VLIW) processors, superscalar processors, vector processors, parallel processors and supercomputers. Digital signal processing design: fixed and floating point processing, digital signal processors (architecture, instruction set, features and applications) and operation design. Computational Intelligence based digital system: artificial neural networks (biological basis, perceptron, back-propagation, feedback), fuzzy logic (fuzzification, inference engine, defuzzification), evolutionary artificial neural networks and other current methods.

### Module Delivery

This module is taught using a structure programme of lectures, tutorials, laboratory exercises and student-centred learning.

**Indicative Student Workload**

|                                                                       | Full Time | Part Time |
|-----------------------------------------------------------------------|-----------|-----------|
| Contact Hours                                                         | 51        | 51        |
| Non-Contact Hours                                                     | 99        | 99        |
| Placement/Work-Based Learning Experience [Notional] Hours             | N/A       | N/A       |
| TOTAL                                                                 | 150       | 150       |
| Actual Placement hours for professional, statutory or regulatory body |           |           |

**ASSESSMENT PLAN**

If a major/minor model is used and box is ticked, % weightings below are indicative only.

**Component 1**

|              |                                                                                                                                            |            |     |                    |      |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------|-----|--------------------|------|
| Type:        | Coursework                                                                                                                                 | Weighting: | 50% | Outcomes Assessed: | 1, 4 |
| Description: | A coursework to design and implement a digital system and to develop software related to computational intelligence based digital systems. |            |     |                    |      |

**Component 2**

|              |                            |            |     |                    |      |
|--------------|----------------------------|------------|-----|--------------------|------|
| Type:        | Examination                | Weighting: | 50% | Outcomes Assessed: | 2, 3 |
| Description: | A closed book examination. |            |     |                    |      |

**MODULE PERFORMANCE DESCRIPTOR****Explanatory Text**

To pass the module you must achieve at least 40% weighted average mark in the exam and coursework. In addition you need to achieve at least 35% in both the individual exam and coursework Components.

| Module Grade | Minimum Requirements to achieve Module Grade:                                  |
|--------------|--------------------------------------------------------------------------------|
| <b>A</b>     | =>70%                                                                          |
| <b>B</b>     | 60-69%                                                                         |
| <b>C</b>     | 50-59%                                                                         |
| <b>D</b>     | 40-49%                                                                         |
| <b>E</b>     | 35-39%                                                                         |
| <b>F</b>     | 0-34%                                                                          |
| <b>NS</b>    | Non-submission of work by published deadline or non-attendance for examination |

**Module Requirements**

|                          |       |
|--------------------------|-------|
| Prerequisites for Module | None. |
| Corequisites for module  | None. |
| Precluded Modules        | None. |

**INDICATIVE BIBLIOGRAPHY**

- 1 DU, K.L. and SWAMY, M.N.S., 2006. Neural Networks in a Softcomputing Framework. London: Springer.
- 2 HAYKIN, S., 2008. Neural Networks and Learning Machines: A Comprehensive Foundation. 3rd ed. London: Pearson Education.
- 3 NEGNEVITSKY, M., 2011. Artificial Intelligence: A Guide to Intelligent Systems. 3rd ed. Harlow: Addison-Wesley.
- 4 HENNESSY, J.L. and PATTERSON, D.A., 2011. Computer Architecture: A Quantitative Approach. 5th ed. Amsterdam, Netherlands: Morgan Kaufmann.
- 5 CHASSAING, R. and REAY, D.S., 2008. Digital Signal Processing and Applications with the TMS320C6713 and TMS320C6416 DSK. 2nd ed. Hoboken, NJ: Wiley-Blackwell.