1. **Title of the module**

EENG8270 (EL827) - Advanced Digital Communications

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

Engineering and Digital Arts

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

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

None

1. **The programmes of study to which the module contributes**

MSc/PGDip in Advanced Communications Engineering

MSc/PGDip in Advanced Electronic Systems Engineering

MEng Electronic and Communications Engineering (option)

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

8.1 Understand the principles of different digital modulation schemes, wireless multiple access technologies, and how to analyse them.

8.2 Understand the principles of multichannel and multicarrier communications.

8.3 Understand the principles of multiple input multiple output systems.

8.4 Understand the principles of error correcting codes and be able to analyse and design in outline the digital circuits employed.

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

9.1 Use mathematical models and scientific principles and have the ability to integrate information and data that contribute to the Intellectual Skills.

9.2 Demonstrate skill in generating, analysing, and interpreting data, which contribute to generic programme learning outcomes in the category of Professional Practical Skills.

* 1. Effectively use ICT.

9.4 Develop interpersonal skills and core key skills, such as learning effectively, critical thinking and time management, to contribute to the Transferable/Key Skills in the generic learning outcomes for the MSc and PDip programmes.

1. **A synopsis of the curriculum**

**Digital Communication**

Advanced modulation and optimal receivers design and their performances of M-ary PSK and QAM; Signal design for bandlimited channels; Carrier and symbol synchronization; Multichannel and multicarrier communications (e.g. OFDM); Filterbank based Multicarrier Transmission (FBMC); Spread spectrum and CDMA signals for digital communications; Multiuser communications; multiple input multiple output (MIMO) technology.

**Channel Coding**

Channel coding concept and properties. Block codes, convolutional codes and Turbo codes, Polar codes and LDPC codes

**Coursework**

Digital Communication.

Seven examples classes.

Channel Coding

Four examples classes.

**Simulink**

Two 4-hour laboratory sessions introducing Simulink and its application to digital communications. An assessed assignment on a digital communications link.

1. **Reading list (Indicative list, current at time of publication. Reading lists will be published annually)**

Recommended Reading:

* Digital Communications 5th Edition, J. Proakis and M. Salehi, McGraw-Hill International Editions, 2008
* Wireless Communications, A. Goldsmith, Cambridge Press, 2006
* Latest research results

Background Reading:

* Probability Random Variables and Stochastic Processes, A. Papoulis, 4th Edition, McGraw-Hill, 2002
1. **Learning and teaching methods**

Total contact hours: 41

Private study hours: 109

Total study hours: 150

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

Practical (25%)

Examination (75%)

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 | 9.1 | 9.2 | 9.3 | 9.4 |
| **Learning/ teaching method** |  |  |  |  |  |  |  |  |
| **Private Study** | **X** | **X** | **X** | **X** | **X** | **X** | **X** | **X** |
| *Lectures* | **X** | **X** | **X** | **X** | **X** |  |  |  |
| *Example classes* | **X** | **X** | **X** | **X** | **X** |  |  |  |
| *Simulation Labs* |  | **X** |  |  |  | **X** | **X** | **X** |
| **Assessment method** |  |  |  |  |  |  |  |  |
| *Examination* | **X** | **X** | **X** | **X** | **X** |  |  | **X** |
| *Simulation Labs* |  | **X** |  |  |  | **X** | **X** | **X** |

1. **Inclusive module design**

The School/Collaborative Partner *(delete as applicable)* 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**

Consideration is made in the design aspects of this module to include international variations in system requirements. For instance, the differing frequency bands used in different legislative regimes.

**DIVISIONAL SUPPORT OFFICE 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) |
| 03/12/19 | Major | Sep 2020 | 1, 7, 8, 10, 13 | No |
|  |  |  |  |  |