1. **Title of the module**

EENG5650 (EL565) Instrumentation and Measurement Systems

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

Computing, Engineering and Mathematical Sciences

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

Level 5

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**
2. **The courses to which the module contributes**

BEng Electronic and Communications Engineering with a Foundation Year

BEng/MEng Electronic and Communications Engineering

BEng/MEng Electronic and Communications Engineering with a Year in Industry

BEng Electronic and Computer Engineering with a Foundation Year

BEng/MEng in Electronic and Computer Engineering

BEng/MEng in Electronic and Computer Engineering with a Year in Industry

BEng in Mechanical Engineering with a Foundation Year

BEng in Mechanical Engineering

BEng in Mechanical Engineering with a Year in Industry

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

8.1. Have a knowledge and critical understanding of the well-established principles underpinning measurement;

8.2. Have a knowledge and critical understanding of the well-established principles of measurement systems and instrument design;

8.3. Have a knowledge and critical understanding of sensors;

8.4. Have a knowledge and critical understanding of analogue signal conditioning and processing;

8.5. Have an understanding of power supplies.

8.6. Have the necessary skills to apply underlying concepts and principles to apply sensors and instruments and analyse their outputs.

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

9.1. analyse, interpret and present experimental data using a variety of methods

1. **A synopsis of the curriculum**

Error analysis, general principles of measurement and instrumentation, sensors, signal conditioning and data presentation elements, and power supplies. The role of the various elements of a measurement system and evaluation of a measurement system for a given application. Construction and testing of measurement systems using common sensors and signal conditioning components. Real-world case studies such as acoustic emission detection, vibration monitoring, triboelectric sensing, flow measurement and structural heath monitoring are provided to illustrate the applications and significance of measurement systems in industry.

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

* Grounding & Shielding Techniques in Instrumentation (1997), R. Morrison, Wiley
* Principles of Measurement Systems, (2005) Bentley, Longman
* Sensors and Systems, Usher M.J. and Keating,(1996) D.A., MacMillan
* The Art of Electronics (2nd Ed),(2006) Horowitz & Hill, Cambridge University Press
* Transducers & Interfacing, (1991) Bannister & Whitehead, Van Nostrand Reinhold
* Electronics - A Systems Approach, (2018), Neil Storey, Pearson Education

1. **Learning and teaching methods**

Total contact hours: 40

Private study hours: 110

Total study hours: 150

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

* Laboratory Reports, (four reports with 7.5% each), 30%
* Exam 2 hours (70%)

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 | 8.6 | 9.1 |
| **Learning/ teaching method** |  |  |  |  |  |  |  |
| Private Study | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| Lectures | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| Lab Experiments | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| Example classes | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| **Assessment method** |  |  |  |  |  |  |  |
| Lab reports | **x** | **x** | **x** | **x** | **x** | **x** | **x** |
| Exam | **x** | **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**

Engineering is an international discipline with techniques developed and refined by scientists across the globe. Mastery of the subject-specific learning outcomes, will equip students to apply the theories and techniques of this module in a wide range of international contexts. Some practical laboratory work is undertaken using internationally recognised software tools and equipment to design sensors and signal conditioning circuits and to analyse experimental data. Some real-life examples in the industrial case studies are derived from the internationally collaborative projects undertaken by the Instrumentation team at Kent and research papers published in leading international journals by the Instrumentation team. The module team includes members of staff with international experience of teaching and research collaboration. In compiling the reading list, consideration has been given to the range of texts that are available internationally and a selection of texts has been identified to complement the delivery of the material. The support provided to the students is also internationally attuned given our international student body.

**DIVISION 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 the delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
| 11.04.2022 | Minor | September 2022 | 12, 13 | No |
|  |  |  |  |  |

Revised FSO Jan 2018

Revised Yong Yan Sept 2021, Feb 2022, April 2022