1. **Title of the module**

EENG8580 (EL858) - Advanced Pattern Recognition Techniques

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)**

Spring

1. **Prerequisite and co-requisite modules**
2. **The programmes of study to which the module contributes**

MSc/PDip Information Security and Biometrics (option)

MSc/PDip Advanced Electronic Systems Engineering (option)

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

8.1 Design and implement biometric systems.

8.2 Critically appraise alternative applications of pattern recognition systems.

8.3 Understand, in detail, the operation of advanced pattern classification techniques involving multi-modal systems.

These outcomes are related to the programme learning outcomes in the appropriate curriculum maps as follows:

MSc/PDip Engineering with Finance: A1-A3, A6, B1, B3, B5, B6, C5-C7

MSc/PDip in Information Security and Biometrics: A1-A3, B1-B3, C6-C8

MSc/PDip in Advanced Electronic Systems Engineering: A6, B4, B7, C7

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

9.1 Show ability to deal with complex issues systematically and creatively and make judgements in the absence of complete data, and show self-direction in tackling and solving problems. (D1)

9.2 Use ICT. (D2)

9.3 Demonstrate effective communication to specialist (and non-specialist) audiences. (D4)

9.4 Show that they can learn independently for CPD, will use critical thinking, reasoning and reflection and demonstrate autonomy in time and resource management. (D5-D6)

1. **A synopsis of the curriculum**

Advanced Techniques for Feature Classification and Multi-Modal Systems

Analysis of Bayesian Classification; Feature selection strategies using genetic algorithms and Principal Component Analysis; Multiple classifier combination strategies. Intelligent and dynamically adaptable classification techniques; Multi-source biometric systems and score normalisation techniques.

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

Recommended Reading:

* S. Theodoridis, K. Koutroumbas. Pattern Recognition. Elsevier, 2003
* L. I. Kuncheva. Combining Pattern Classifiers – Methods and Algorithms. Wiley and Sons, 2004
* R.O. Duda, P.E. Hart, D.G. Stork, Pattern Classification 2e, Willey, 2001

Background Reading:

* S.Y. Kung, M.W. Hak, S.H. Lin. Biometric Authentication: A Machine Learning Approach, Prentice Hall, 2005
* A.K. Jain, P. Flym, A.A. Ross, Handbook of Biometrics, Spring, 2008
* A.A. Ross, K. Nandakumar, A.K. Jain, Handbook of Multibiometrics, Springer, 2006
* James Wayman, Anil Jain, Davide Maltoni, Dario Maio (Eds). Biometric Systems: Technology, Design and Performance Evaluation. Springer-Verlag UK, 2005

And selected articles from the published technical literature.

1. **Learning and teaching methods**

Total contact hours: 39

Private study hours: 111

Total study hours: 150

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

Workshops (35%)

A number of workshops will look into the (software) implementation and analysis of various elements of pattern recognition systems and will be assessed by the workshop reports submitted.

Examination (65%) – a 2-hour examination

In order to obtain credit for this module on IET accredited programmes, the coursework mark and the exam mark must each be greater than or equal to 40% as well as achieving the pass mark for the module. This module will only be considered for compensation if the coursework mark and exam mark are each greater than 40%.

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* | *9.1* | *9.2* | *9.3* | *9.4* |
| **Learning/ teaching method** |  |  |  |  |  |  |  |
| Private Study |  |  |  | **X** |  |  | **X** |
| Workshop | **X** | **X** |  | **X** | **X** | **X** | **X** |
| Lectures |  | **X** | **X** |  |  |  |  |
| **Assessment method** |  |  |  |  |  |  |  |
| Examination | **X** | **X** | **X** | **X** |  |  | **X** |
| Workshops | **X** | **X** |  | **X** | **X** | **X** | **X** |

1. **Inclusive module design**

The School 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**

Security assurance is a global challenge and biometric technology is one of the standard methodology adopted to deal with this challenge. This module’s curriculum is comparable to those of internationally leading institutions and teaching materials used are resourced from publications in international journals and conference proceedings as well as research outputs at Kent. The workshops involve usage of industry standard software platforms/tools and uses real world data. The learning outcome is generic which makes the acquired knowledge instantly globally transferrable. The significant part of student cohort are international students, which provides the learning experience from a global perspective.

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**Revision record – all revisions must be recorded in the grid and full details of the change retained in the appropriate committee records.**

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| --- | --- | --- | --- | --- |
| Date approved | Major/minor revision | Start date of the delivery of revised version | Section revised | Impacts PLOs (Q6&7 cover sheet) |
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Revised FSO Jan 2018