Subject Description Form

Subject Code	EIE621 – EIE623
Subject Title	Special Topics in Electronic and Information Engineering I/II/III
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	Students are expected to have acquired knowledge in digital communications, power electronics, digital signal processing, biomedical engineering or bio-electronics equivalent to that taught in the final year of an Honours Degree in Electronic/Electrical/Information Engineering.
Objectives	This subject aims to equip students with the comprehensive knowledge in a selected research topic from the following areas in Electronic and Information Engineering: advanced communications systems, advanced power electronics, multimedia signal processing and biosensor technologies.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: 1. understand the state-of-the-art developments and trends in a selected research topic from the following areas: advanced communications systems, advanced power electronics, multimedia signal processing and biosensor technologies; 2. familiarize themselves with the technical knowhow and the tools for the analysis and design made in the selected research topic.
Subject Synopsis/ Indicative Syllabus	The contents of the guided study are based on any one or more research topics in the list of the area (1 to 4) selected by the student: 1. Advanced communications systems (i) Wireless Communications (ii) Wireless Networking (iii) Communication Theory (iv) Signal Processing for Communications (v) Optical Networks and Systems (vi) Next-Generation Networking (vii) Communication QoS, Reliability & Modeling (viii) Ad-hoc and Sensor Networking (ix) Communication Software and Services (x) Communication and Information Systems Security (xi) Cognitive Radio and Networks 2. Advanced power electronics (i) Power semiconductors, Power integrated circuits (PIC), passive components and packaging technologies (ii) Motor drives and motion control (iii) Analysis and design of electrical machines (iv) Hard-switching and soft-switching static power converters and UPS (v) Applications of power electronics in power system and generation/FACTS (vi) Power quality issues, harmonic problems and solutions (vii) EMI/EMC issues (viii) Traction and automotive systems

	(ix) Applications of power electronics in home appliance, industry and aerospace (x) Renewable energy technologies (xi) Distributed generation and smart-grid (xii) Modelling and simulation in power electronics (xiii) Power electronics related education/professional development (xiv) Bio-medical power electronics (xv) Telecommunications power supplies (xvi) Micro-electromechanical systems (MEMS) (xvii) Power electronic emerging technologies 3. Multimedia signal processing (i) Coding and compression of multimedia signals (ii) Multimedia for communication and collaboration (iii) Multimedia database and data retrieval (iv) Multimedia forensics (v) Client-cloud multimedia systems, applications, and experiences (vi) Virtual reality signal processing (vii) Scene analysis (viii) Multimedia networking (ix) Emerging topics in multimedia signal processing 4. Biosensor technologies (i) Bioelectronics (ii) Commercial biosensors, manufacturing and markets (iii) DNA chips, nucleic acid sensors and aptasensors (iv) Enzyme-based biosensors (v) Immunosensors (vi) Lab-on-a-chip (vii) Microfluidics and immobilisation technology (viii) Nanobiosensors, nanomaterials & nanoanalytical systems (ix) Natural & synthetic receptors (including MIPs) (x) Organism- and whole cell-based biosensors (xi) Printed biosensors and micro- and nanofabrication (xii) Proteomics, single-cell analysis and cancer-cell detection (xiii) Imaging and fluorescence (xiv) Signal transduction technology (xv) Signal conditioning and measurement certainty (xvi) Theranostics & implantable sensors

Teaching/Learning Methodology

The subject can be conducted via guided study in two modes for individual students. Mode I requires a student to take an MSc subject related to the topics of the guided study subject or a relevant short course as the basis of the guided study subject. The student will be required to participate fully in the MSc subject/relevant short course (i.e. attend all the lectures, complete both the coursework and examination requirements). To bring the subject up to the doctoral level, a student is required to submit further write-ups and presentations. An overall grade for the guided study subject is then derived from the result of the MSc subject as well as the extra writes-up and presentations. Mode II is operated for guided study subjects with no relevant MSc subject/short course available. A student is required, under the supervision of the subject supervisor, to read specified monographs, journal publications and/or a book. The student and the subject supervisor must meet regularly to discuss the progress made by the student in the subject. Coursework in terms of literature survey reports and presentations should normally be included. At the end of the semester the student will be examined, normally both orally and in written form. All of the above contributes to both intended learning outcomes of the subject.

Alignment of learning & teaching activities with the ILOs (Mode I)

Teaching/Learning Methodology	**Intended subject learning outcomes**	
	1	**2**
1. Lectures	✓	✓
2. Tutorials / Laboratories	✓	✓
3. Literature survey	✓	✓
4. Write-ups and presentations	✓	✓

Alignment of learning & teaching activities with the ILOs (Mode II)

Teaching/Learning Methodology	**Intended subject learning outcomes**	
	1	**2**
5. Literature survey	✓	✓
6. Write-ups and presentations	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

For Model I study, it includes the courseworks and examination of an MSc subject and additional assignments given by the teaching staff. The additional assignments include write-ups and presentations.

Specific assessment methods/tasks	**% weighting**	**Intended subject learning outcomes to be assessed**	
		1	**2**
1. MSc subject (include coursework and examination)	67	✓	✓
2. Additional assignments (include write-ups and presentations)	33	✓	✓
Total	100		

For Mode II study, the Coursework part will include the coursework of the study assigned by the teaching staff. The Examination part will include the written and oral examination of the study assigned by the teaching staff.

Specific assessment methods/tasks	**% weighting**	**Intended subject learning outcomes to be assessed**	
		1	**2**
1. Coursework (normally assignments and presentations)	45	✓	✓
2. Examination (normally both written and oral, conducted by the responsible staff and a staff member who is knowledgeable in the topic)	55	✓	✓
Total	100		

Student Study Effort Expected

(Mode I)

Class contact (time-tabled):	
• Lecture	24 Hours
• Tutorial/Laboratory/Practical Classes	15 Hours
Guided activities:	
• Meeting with the supervisor / Presentations/ Viva examination	10 Hours
• Self-study / Preparation of reports and presentation materials	56 Hours
Total student study effort	105 Hours

(Mode II)	**Guided activities:**	
	• Meeting with the supervisor / Presentations/ Viva examination	20 Hours
	• Self-study / Preparation of reports and presentation materials	85 Hours
	Total student study effort	105 Hours
Reading List and References	Will be assigned by the teaching staff.	