



THE HONG KONG  
POLYTECHNIC UNIVERSITY  
香港理工大學

## **Doctor of Philosophy (PhD) / Master of Philosophy (MPhil)**

(Full-Time: 88011/88012 / Part-Time: 88111/88112)

**Programme Booklet (2015/16)**

**Department of Electronic and Information Engineering**

電子及資訊工程學系

**DOCTOR OF PHILOSOPHY (PHD) / MASTER OF PHILOSOPHY (MPHIL)  
(FULL-TIME: 88011/88012 / PART-TIME: 88111/88112)**

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*This Programme Booklet is subject to review and changes which the Department can decide to make from time to time. Students will be informed of the changes as and when appropriate.*

*This document should be read together with the “Regulations and Administrative Procedures for the Degrees of MPhil and PhD” and the “Research Student Handbook” available at <http://www.polyu.edu.hk/ro/STDHBK/>.*

## 1. GENERAL INFORMATION

### 1.1 Cohort of Intakes and Readership

This programme booklet is the programme document for the 2015/16 cohort. Just in case any updated information is necessary after the publication of this booklet, students are requested to refer to the URL "[http://www.eie.polyu.edu.hk/docs/Programmes/Booklets/PhD\\_MPhil/PhD\\_MPhil\\_Programme\\_Booklet\\_1516.pdf](http://www.eie.polyu.edu.hk/docs/Programmes/Booklets/PhD_MPhil/PhD_MPhil_Programme_Booklet_1516.pdf)" for the most updated information. Should any discrepancy between the contents of this booklet and University regulations arise, University regulations always prevail.

### 1.2 Programme Information

<b>Title of Programme</b>	<b>Doctor of Philosophy (PhD) / Master of Philosophy (MPhil)</b>
Host Department	Department of Electronic and Information Engineering (EIE)
Mode of Attendance	Full-time/Part-time
Programme Structure	Coursework Credits and Thesis

**Final Award**            **Doctor of Philosophy (PhD) / Master of Philosophy (MPhil)**  
   哲學博士 / 哲學碩士

### **Modes of attendance**

There are two possible modes of study: Full-time (FT) mode and Part-time (PT) mode. Students will normally be admitted into the research degree programmes under the full-time mode of study. Admission to the part-time mode of study will be subject to study plan and needs.

### **PhD Programme**

#### Full-time

Normal Study Period:

36 months (or 48 months for students admitted with a Bachelor's degree)

Maximum Study Period:

60 months (or 72 months for students admitted with a Bachelor's degree)

#### Part-time:

Normal Study Period:

72 months (or 96 months for students admitted with a Bachelor's degree)

Maximum Study Period:

84 months (or 108 months for students admitted with a Bachelor's degree)

### **MPhil Programme**

#### Full-time

Normal Study Period:

24 months

Maximum Study Period:

36 months

#### Part-time:

Normal Study Period:

48 months

Maximum Study Period:

60 months

*Note: Under the residence requirement, all research students must spend at least 12 months of their study period at PolyU.*

## 2. RATIONALE, AIMS AND INTENDED LEARNING OUTCOMES OF THE PROGRAMME

### 2.1 Background and Rationale

Electronic and information engineering are among the key technologies that play important roles in daily living. Various sectors, such as business, commerce, communication, education, entertainment, healthcare and transportation, require electronic and information engineering for smooth operation. Hence, it is envisioned that there is a great need of professionals who possess knowledge and leadership in the areas of electronic and information engineering, as well as generic skills of problem solving, innovation, analysis and adaptability to contribute to the technological and economic development in the region and in the world.

### 2.2 Aims

The research degree programmes are designed to enable students to:

1. acquire competence in research methods and scholarship; and
2. display sustained independent effort and independent original thought.

The PhD programmes should target to produce academics, researchers or industrial R & D professionals.

### 2.3 Relationship of Programme Aims to University Missions

The University has the following missions:

1. To nurture graduates who are critical thinkers, effective communicators, innovative problem solvers, lifelong learners and ethical leaders.
2. To advance knowledge and the frontiers of technology to meet the changing needs of society.
3. To support a University community in which all members can excel through education and scholarship.

The following table illustrates the relationship between Programme Aims and University Missions:

Programme Aims	University Missions		
	1	2	3
1	X	X	X
2	X	X	X

## 2.4 Intended Learning Outcomes of the Programme

On successful completion of the research degree programme, students will be:

1. able to understand the copyright and ethical issues related to research and publications;
2. able to formulate research objectives and analyze research problems;
3. able to apply relevant and/or develop advanced techniques to conduct research;
4. able to conduct high-quality independent research in the Electronic and Information Engineering discipline;
5. able to disseminate research results effectively in both written and oral forms;
6. able to assimilate advanced knowledge in the Electronic and Information Engineering discipline;
7. prepared for a professional career in the academia/ industry/ business/ public/private sector; and
8. prepared to pursue a PhD degree (for MPhil graduates).

The following table illustrates the relationship between Programme Outcomes and Programme Aims:

Programme Outcomes	Programme Aims	
	1	2
1	X	
2	X	X
3	X	
4	X	X
5	X	
6	X	X
7		X
8		X

## 2.5 Relationship between the Intended Learning Outcomes of the Programme with Subjects

The curriculum map below illustrates the relationship between the Learning Outcomes of the Programme and the subjects:

Programme Outcomes	HTI6081 Ethics: Research, Professional & Personal Perspectives	EIE6200 Methodology for Engineering and Scientific Research	EIE6207 Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing	Research Postgraduate courses in PolyU/other universities OR EIE6800 – EIE6808 Guided-study Subjects	EIE604 – EIE609, EIE613 – EIE618 Engineering Doctorate Guided-study Subjects (Mode I)	EIE6201 – EIE6204 Research Seminar	EIE6205 – EIE6206 Practicum	Thesis and Oral Examination
Understand the copyright and ethical issues related to research and publications	√	√						
Formulate research objectives and analyze research problems		√	√		√			√
Apply relevant and/or develop advanced techniques to conduct research			√		√			√
Conduct high-quality independent research in the Electronic and Information Engineering discipline								√
Disseminate research results effectively in both written and Oral forms		√						√
Assimilate advanced knowledge in the Electronic and Information Engineering discipline			√	√	√	√		√
Prepare students for a professional career in the academia/ industry/ business/ public/private sector							√	√
Prepare students to pursue a PhD degree (for MPhil graduates)								√

### 3. ENTRANCE REQUIREMENTS

#### 3.1 University General Minimum Entrance Requirements

To register for the degree of MPhil, a student shall hold:

- a Bachelor's degree with first or second class honours of The Hong Kong Polytechnic University or a recognised university; or
- other academic qualifications which are deemed to be equivalent.

To register for the degree of PhD, a student shall hold:

- a postgraduate degree containing a significant research component, such as a dissertation, conferred by The Hong Kong Polytechnic University or a recognised university.

In exceptional circumstances applicants other than those stipulated in the above paragraph may be admitted directly to the PhD programme. For example, applicants with a Bachelor's degree with First Class Honours, or the equivalent.

Admission can be made based on other equivalent qualifications on an individual basis.

#### 3.2 English Language Requirement

Requirements for students who do not have a degree of which the language of instruction was English from a recognised university are:

- An overall score of at least 6.5 (with score for the writing component at 6.0 or above) in the International English Language Testing System (IELTS); or
- 575 or above in the Test of English as a Foreign Language (TOEFL) for the paper-based test (with a score of at least 4 out of 6 in the Test of Written English), or 90 or above in the internet-based test (with a writing score of 23 or above).

Alternatively, consideration will be given to acceptable scores in other internationally-recognised public examinations, such as the Graduate Record Examination (GRE) or the Graduate Management Admission Test (GMAT).

All English language test scores are considered valid for five years after the date of the test.



### 3.3 Language Proficiency Requirement after Admission

On admission, all students must sit for the Research Language Skills Assessment which will focus on assessing students' language skills in academic writing and oral communication. Before thesis submission, students will be required to take and pass the language enhancement subjects/programmes if improvement in the related areas is required after the Assessment.

## 4. PROGRAMME, SUBJECTS, AND CREDITS

### 4.1 Programme Specified Subjects

Most subjects are of standard credit value carrying 3 credits each, except for some subjects, such as Research Seminars, Practicum, etc. which carry credits other than 3. The following table lists the subjects, their credit values, and the category they belong to (Compulsory or Elective).

Mode and level	Subject	Compulsory/ Elective	Credit
MPhil 2-year Full-time/ 4-year Part-time	HTI6081 Ethics: Research, Professional & Personal Perspectives	Compulsory	1
	EIE6200 Methodology for Engineering and Scientific Research	Compulsory	3
	EIE6201 Research Seminar (I)	Compulsory	1
	EIE6202 Research Seminar (II)	Compulsory	1
	<u>ONE elective</u> from:	Elective	3
	EIE6207 Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing		
	OR Guided-study Subjects EIE6800 – EIE6808		
	OR Engineering Doctorate Guided-study Subjects EIE604 – EIE609, and EIE613 – EIE618 (Mode I: with accompanying MSc subject)		
OR Research postgraduate courses offered by PolyU or other universities			
	Thesis	Compulsory	–
<b>Total: 9 credits</b>			

Mode and level	Subject	Compulsory/ Elective	Credit
PhD 3-year Full-time/ 6-year Part-time	HTI6081 Ethics: Research, Professional & Personal Perspectives	Compulsory	1
	EIE6200 Methodology for Engineering and Scientific Research	Compulsory	3
	EIE6201 Research Seminar (I)	Compulsory	1
	EIE6202 Research Seminar (II)	Compulsory	1
	EIE6203 Research Seminar (III)	Compulsory	1
	EIE6205 Practicum (I)	Compulsory	1
	EIE6206 Practicum (II)	Compulsory	1
	EIE6207 Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing	Compulsory	3
	<u>ONE elective from:</u> Guided-study Subjects EIE6800 – EIE6808 OR Engineering Doctorate Guided-study Subjects EIE604 – EIE609, and EIE613 – EIE618 (Mode I: with accompanying MSc subject) OR Research postgraduate courses offered by PolyU or other universities	Elective	3
	Thesis	Compulsory	–
<b>Total: 15 credits</b>			

Mode and level	Subject	Compulsory/ Elective	Credit
PhD 4-year Full-time/ 8-year Part-time	HTI6081 Ethics: Research, Professional & Personal Perspectives	Compulsory	1
	EIE6200 Methodology for Engineering and Scientific Research	Compulsory	3
	EIE6201 Research Seminar (I)	Compulsory	1
	EIE6202 Research Seminar (II)	Compulsory	1
	EIE6203 Research Seminar (III)	Compulsory	1
	EIE6204 Research Seminar (IV)	Compulsory	1
	EIE6205 Practicum (I)	Compulsory	1
	EIE6206 Practicum (II)	Compulsory	1
	EIE6207 Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing	Compulsory	3
	<u>THREE electives</u> from: Guided-study Subjects EIE6800 – EIE6808  OR Engineering Doctorate Guided-study Subjects EIE604 – EIE609, and EIE613 – EIE618 (Mode I: with accompanying MSc subject) <i>[Students are only allowed to take ONE subject from this pool.]</i>  OR Research postgraduate courses offered by PolyU or other universities	Elective	9
Thesis	Compulsory	–	
<b>Total: 22 credits</b>			

## 4.2 Research Seminar Attendance

- 4.2.1 All full-time MPhil and PhD students have to attend a minimum of 10 research seminars per year, in addition to workshops/conferences, and to submit a report, to the Chief Supervisor, of no less than 1,500 words (excluding references) on one of the attended seminars every year.
- 4.2.2 All part-time students are required to attend at least 10 research seminars in every two years, in addition to workshops/conferences, and to submit a report, to the Chief Supervisor, of no less than 1,500 words (excluding references) on one of the attended seminars once every two years.
- 4.2.3 The research seminars may or may not be organised by the host department and are expected to last not less than an hour each. The topic of the seminar reported on should not be related directly to the thesis title of the student.
- 4.2.4 Chief Supervisors will assess the report which will be given either a pass or failure grade. Students failing to submit a report to the satisfaction of their Chief Supervisor are required to make a re-submission until a pass grade is obtained. The Chief Supervisor should then pass the record of the seminars attended by their students and the report to the Research Office for custody at the end of each academic year.
- 4.2.5 Students are recommended to complete one credit per year (for full-time students) or per two years (for part-time students) to fulfil the above-mentioned requirement, with an overall assessment grade of Pass and Fail. However, as deemed appropriate by the Chief Supervisor, they are allowed to complete at most two credits per year (for full-time students) or per two years (for part-time students) to fulfil the research seminar credit requirement.
- 4.2.6 The total Research Seminar Credits to be attained by the students are:
- 2-year FT/4-year PT MPhil: 2 credits
- EIE6201 Research Seminar (I) – 1 credit  
EIE6202 Research Seminar (II) – 1 credit
- 3-year FT/6-year PT PhD : 3 credits
- EIE6201 Research Seminar (I) – 1 credit  
EIE6202 Research Seminar (II) – 1 credit  
EIE6203 Research Seminar (III) – 1 credit

4-year FT/8-year PT PhD : 4 credits

EIE6201 Research Seminar (I) – 1 credit

EIE6202 Research Seminar (II) – 1 credit

EIE6203 Research Seminar (III) – 1 credit

EIE6204 Research Seminar (IV) – 1 credit

#### 4.3 Practicum Requirement

4.3.1 All PhD students, irrespective of the funding source and the mode of study, should attain two practicum credits before thesis submission. To earn one credit, students will be required to engage in teaching/research supporting activities assigned by the Head of Department or his delegate for 6 hours/week in any 13-week semester.

4.3.2 PhD students can complete the practicum anytime before thesis submission. They may choose to complete the practicum within the same semester or in two semesters, subject to the approval of the Chief Supervisor. PhD students who are stipend recipients are allowed to fulfil part of the departmental training requirement through the completion of compulsory practicum credits.

4.3.3 Students who will undertake teaching supporting activities should complete the training programmes organised by the EDC and the ELC before the commencement of such teaching supporting activities. PhD students who are required to undertake teaching supporting activities in their practicum credits will be required to complete a training programme organized by the EDC as required by the Department. Students who are required to interact directly with students in English as a part of their duties in supporting teaching and learning must demonstrate their language competence to fulfill the intended duties to the satisfaction of the host department. All eligible students except those who are native English speakers will also be required to successfully complete a language training programme offered by the ELC before taking up any teaching supporting activities.

4.3.4 The Head of Department or his delegate are required to:

- a. ensure that the teaching/research supporting activities assigned to students are structured and can be assessed properly;
- b. submit to the Subject Assessment Panel, at the end of the practicum, an assessment report on the performance of the relevant student(s), with details of activities undertaken and an overall assessment grade of Pass or Fail.

4.3.5 The two Practicum credits all PhD students must complete before thesis submission are:

EIE6205 Practicum (I) – 1 credit

EIE6206 Practicum (II) – 1 credit

#### 4.4 Thesis

4.4.1 The PhD or MPhil degree is awarded to students who, on completion of an approved programme of study and research, present theses that embody the results of their research and satisfy the examiners in an oral examination in matters relevant to the subject of the thesis. These subjects are chosen by the student, with advice from the supervisor, from a wide range on offer.

4.4.2 PhD and MPhil students must satisfactorily investigate or evaluate a chosen area, demonstrate an understanding of the context and significance of the work, display sustained independent effort and original thought and present a clear, complete thesis of a quality worthy of publication.

4.4.3 PhD students are also expected to produce evidence and argument supporting an original proposition that results in a significant contribution to knowledge of a subject.

4.4.4 Students are required to complete the coursework credit requirements before submission of their thesis for examination. All MPhil students should complete the coursework with a qualifying GPA of 2.75 or above, and all PhD students need to complete the coursework with a qualifying GPA of 3.0 or above before thesis submission.

#### 4.5 Credit Transfer

4.5.1 Credits have been used to contribute to an award should not be transferred to contribute to the coursework requirement of a research programme.

4.5.2 3-year full-time/6-year part-time PhD students may be exceptionally allowed to transfer one credit from their previous studies in HTI6081 Ethics: Research, Professional & Personal Perspectives and one credit from their previous attendance in research seminars.

4.5.3 Credits to be transferred can be gained from within or outside of PolyU.

**5. SPECIFIED PROGRESSION PATTERN**

5.1 Master of Philosophy (MPhil)

<b><u>2-year Full-time / 4-year Part-time MPhil (9 credits)</u></b>		
<b>Year of study</b>	<b>Compulsory</b>	<b>Elective</b>
<b><i>FT Year 1 / PT Years 1 &amp; 2</i></b>		3 credits, i.e. <u>ONE</u> elective from
HTI6081 Ethics: Research, Professional & Personal Perspectives	1 credit	EIE6207 Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing
EIE6200 Methodology for Engineering and Scientific Research	3 credits	OR
EIE6201 Research Seminar (I)	1 credit	Guided-study Subjects # EIE6800 – EIE6808
<b><i>FT Year 2 / PT Years 3 &amp; 4</i></b>		OR
EIE6202 Research Seminar (II)	1 credit	Engineering Doctorate Guided-study Subjects (Mode I: with accompanying MSc subject) ## EIE604 – EIE609, and EIE613 – EIE618
		OR Research postgraduate courses offered by PolyU or other universities
Thesis	–	NA
	<i>Total: 6 credits</i>	<i>3 credits</i>

5.2 Doctor of Philosophy (PhD)

<b><u>3-year Full-time / 6-year Part-time PhD (15 credits)</u></b>		
<b>Year of study</b>	<b>Compulsory</b>	<b>Elective</b>
<b><i>FT Year 1 / PT Years 1 &amp; 2</i></b>		3 credits, i.e. <u>ONE elective</u> from Guided-study Subjects # EIE6800 – EIE6808  OR Engineering Doctorate Guided-study Subjects (Mode I: with accompanying MSc subject) ## EIE604 – EIE609, and EIE613 – EIE618  OR Research postgraduate courses offered by PolyU or other universities
HTI6081 Ethics: Research, Professional & Personal Perspectives	1 credit	
EIE6200 Methodology for Engineering and Scientific Research	3 credits	
EIE6201 Research Seminar (I)	1 credit	
EIE6205 Practicum (I)	1 credit	
EIE6207 Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing	3 credits	
<b><i>FT Year 2 / PT Years 3 &amp; 4</i></b>		
EIE6202 Research Seminar (II)	1 credit	
EIE6206 Practicum (II)	1 credit	
<b><i>FT Year 3 / PT Years 5 &amp; 6</i></b>		
EIE6203 Research Seminar (III)	1 credit	
Thesis	–	NA
<i>Total:</i>	<i>12 credits</i>	<i>3 credits</i>



5.2 Doctor of Philosophy (PhD) (Con't)

<b><u>4-year Full-time / 8-year Part-time PhD (22 credits)</u></b>		
<b>Year of study</b>	<b>Compulsory</b>	<b>Elective</b>
<b><i>FT Year 1 / PT Years 1 &amp; 2</i></b>		9 credits, i.e. <u>THREE</u> electives from Guided-study Subjects # EIE6800 – EIE6808  OR Engineering Doctorate Guided-study Subjects (Mode I: with accompanying MSc subject) ## EIE604 – EIE609, and EIE613 – EIE618 <i>[Students are only                      allowed to take ONE                      subject from this pool.]</i>  OR Research postgraduate courses offered by PolyU or other universities
HTI6081 Ethics: Research, Professional & Personal Perspectives	1 credit	
EIE6200 Methodology for Engineering and Scientific Research	3 credits	
EIE6201 Research Seminar (I)	1 credit	
EIE6205 Practicum (I)	1 credit	
EIE6207 Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing	3 credits	
<b><i>FT Year 2 / PT Years 3 &amp; 4</i></b>		
EIE6202 Research Seminar (II)	1 credit	
EIE6206 Practicum (II)	1 credit	
<b><i>FT Year 3 / PT Years 5 &amp; 6</i></b>		
EIE6203 Research Seminar (III)	1 credit	
<b><i>FT Year 4 / PT Years 7 &amp; 8</i></b>		
EIE6204 Research Seminar (IV)	1 credit	
Thesis	–	NA
<i>Total:</i>	<i>13 credits</i>	<i>9 credits</i>

*Note: These study patterns are only indicative. Students may take the subjects according to their own pace subject to the regulations. They are recommended to consult their supervisor for advice and planning if needed.*

# List of Guided-study Subjects:

- EIE6800 Guided-study in Electronic Engineering I
- EIE6801 Guided-study in Electronic Engineering II
- EIE6802 Guided-study in Electronic Engineering III
- EIE6803 Guided-study in Information Engineering I
- EIE6804 Guided-study in Information Engineering II
- EIE6805 Guided-study in Information Engineering III
- EIE6806 Guided-study in Mathematical Techniques I
- EIE6807 Guided-study in Mathematical Techniques II
- EIE6808 Guided-study in Mathematical Techniques III

## List of Engineering Doctorate Guided-study Subjects (Mode I: with accompanying MSc subject)

- EIE604 Special Topics in Advanced Communications Systems I
- EIE605 Special Topics in Advanced Communications Systems II
- EIE606 Special Topics in Advanced Communications Systems III
- EIE607 Special Topics in Advanced Power Electronics I
- EIE608 Special Topics in Advanced Power Electronics II
- EIE609 Special Topics in Advanced Power Electronics III
- EIE613 Special Topics in Multimedia Signal Processing I
- EIE614 Special Topics in Multimedia Signal Processing II
- EIE615 Special Topics in Multimedia Signal Processing III
- EIE616 Special Topics in Biosensor Technologies I
- EIE617 Special Topics in Biosensor Technologies II
- EIE618 Special Topics in Biosensor Technologies III

## 6. ASSESSMENT REGULATIONS

Academic regulations governing the operation and assessment of all research degree programmes can be found in the Research Handbook.

## 7. SYLLABI (Please see pages 17 to 38)

### Subject Description Form

<b>Subject Code</b>	HTI6081
<b>Subject Title</b>	Ethics: Research, Professional & Personal Perspectives
<b>Credit Value</b>	1
<b>Level</b>	6
<b>Pre-requisite / Co-requisite / Exclusion</b>	None
<b>Objective</b>	<ul style="list-style-type: none"> <li>• To equip students with a deep appreciation of ethical guidelines and codes of conduct that they can apply in their research studies at PolyU and in their future professional and personal lives.</li> </ul>
<b>Intended Learning Outcomes</b>	<p>On successful completion of this subject, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Demonstrate knowledge and understanding of the need for ethical behavior and guiding codes of ethics in research and the professions.</li> <li>2. Understand, discuss and apply ethical principles and codes across a range of disciplines and scenarios</li> <li>3. Demonstrate awareness of current ethical issues and problems in relation to their own discipline and research area</li> <li>4. Critically analyze and discuss scenarios cases of possible or actual ethical misconduct</li> <li>5. Discuss how the guiding principles of ethics in research extend and apply to business, professional and personal codes of conduct and why this important to integrity and the well being of business, the professions and our community.</li> <li>6. Show a fundamental understanding of the issues of copyright, plagiarism and proper citation, and be able to apply this in their own work.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<ul style="list-style-type: none"> <li>• The need for ethics training and the meaning of ethical behavior in research: case studies, disasters and learning by the mistakes of others</li> <li>• Philosophy and codes of ethics and their origins</li> <li>• Culture, religion and the law – how these relate to ethical codes of conduct</li> <li>• Obtaining ethical approval for a research project: procedures and processes</li> <li>• Ethics in life science, humanities, education, business and industry: common issues, guiding principles, discipline specific scenarios</li> <li>• Ethics and human behavior: individual, professional and societal responsibilities</li> <li>• Recent ethical issues affecting Hong Kong and the society in general</li> <li>• Ethical use of information in thesis writing: understanding copyright, plagiarism and proper citation</li> </ul>
<b>Teaching/Learning Methodology</b>	Lecture/seminar/workshop

<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
			1	2	3	4	5	6
	1. Group assignment on discipline specific scenario/case study analysis	50%	√		√			√
	2. Oral presentation	30%		√		√	√	
	3. Attendance	20%			√			
	Total	100 %						
	<p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <ol style="list-style-type: none"> <li>1. Discipline specific scenario/case study analysis will assess ability to identify and analyze ethical issues in the student's own discipline and to present a coherent and detailed critique and plan on how these could be avoided or resolved (giving sources and written work accompanied by a Turn-it-in Report). The group assignment will assess the student's ability to identify, discuss and analyze ethical principles and issues from a wide perspective, and evaluate how individual, professions and societies benefit from following ethically acceptable behavior and practices.</li> <li>2. Oral presentation will assess the students' ability to present and argue the points in support of their rational.</li> </ol>							
<b>Student Study Effort Required</b>	Class contact:							
	• Lecture/seminar/workshop/oral presentation						16 Hrs.	
	Other student study effort:							
	• Self study and group work						27.5 Hrs.	
	• Assignment preparation						15 Hrs.	
	Total student study effort						58.5 Hrs.	
<b>Reading List and References</b>	Materials from the Hong Kong Ethics development website ( <a href="http://www.icac.org.hk/hkedc/eng/library2.asp">http://www.icac.org.hk/hkedc/eng/library2.asp</a> )							
	Materials from EthicsWeb.ca ( <a href="http://www.ethicsweb.ca/resources/professional/issues.html">http://www.ethicsweb.ca/resources/professional/issues.html</a> )							
	Selected readings and videos							
	Declaration of Helsinki (revised 2008)							

### Subject Description Form

<b>Subject Code</b>	EIE6200
<b>Subject Title</b>	Methodology for Engineering and Scientific Research
<b>Credit Value</b>	3
<b>Level</b>	6
<b>Pre-requisite / Co-requisite / Exclusion</b>	Nil
<b>Objectives</b>	<p>This subject aims to equip students with the methodologies necessary for conducting engineering and scientific research. The objectives of this subject include:</p> <ul style="list-style-type: none"> <li>(i) To enable students to have a broad concept on the philosophy of research</li> <li>(ii) To introduce students with the methods and process for the design and formulation of a research study, as well as the different types of scientific research approaches and methods</li> <li>(iii) To familiarize students with the methods for validating and presenting research results</li> </ul>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>1. identify and select appropriate research problems;</li> <li>2. formulate research objectives, analyze the problem, state hypotheses;</li> <li>3. identify the safety and ethical issues in a research study;</li> <li>4. identify, select appropriate research methods and develop process for conducting research;</li> <li>5. appreciate published literature and write research paper; and</li> <li>6. make professional presentations of research results and defend the propositions and claims.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><u>Keyword Syllabus</u></p> <p>This subject provides students with the following key topics:</p> <ol style="list-style-type: none"> <li>1. Research Philosophy and Ethics in Engineering Research Overview of research philosophy and purposes such as positivism/interpretivism, significance of research in society, etc.; importance of research ethics; professional codes and policies of research ethics in engineering; ethical decision making in research; safety considerations in research; case studies.</li> <li>2. Scientific Research Methods Observation and description; cause and effect; analysis and synthesis; hypothesis, deduction, induction, testing of hypothesis; system modeling; action research, design-based approach; mathematical, modelling, and numerical computations; probability, randomness and logic.</li> <li>3. Conducting a Research Process for developing research plan; formulation of research problem; feasibility and significance studies; critical review of literature; design experiments and apparatus; measurement of human information, questionnaire design; quantitative vs qualitative research or mixed methods, empirical research; classification and sampling; analysis of experimental data; errors of measurement, validity, reliability, and uncertainty analysis of research findings; reporting research results.</li> <li>4. Writing and Presentation Techniques Tools for preparing research document; preparing research proposal; research paper writing and style; thesis writing and style; making oral and poster presentations.</li> </ol>

<p><b>Teaching/Learning Methodology</b></p>	<ul style="list-style-type: none"> <li>To help the students understand the importance of academic honesty and learn ways to ensure that the work and behavior at PolyU are acceptable, the students are required to complete the “Online Tutorial on Academic Integrity” not later than Week 5. <u>The Online Tutorial is part of the subject completion requirement. Students who fail to complete the Online Tutorial will fail this subject.</u></li> <li>Formal classroom lectures will be given to introduce the concepts in research philosophy, ethics and safety in research, scientific research methods, methodologies when conducting a research, as well as writing and presentation techniques. They support the intended learning outcome 1 to 6.</li> <li>A workshop will be given to familiarize students the tools for preparing research documents. It supports the intended learning outcome 6.</li> <li>Each student is required to complete a mini-project in which the student will select a problem of his/her interest, conduct a literature search, generate/collect research data, and finally prepare research papers. A mini-conference will be held at the end to allow the students to practice making oral and poster presentations of the papers they developed in the mini-project. Students will also work as the reviewer of the conference to give critical comments on the paper submissions. They support the intended learning outcome 1 to 6.</li> </ul>																																														
<p><b>Assessment Methods in Alignment with Intended Learning Outcomes</b></p>	<p>In addition to the assessment methods below, the students are required to complete the “Online Tutorial on Academic Integrity” not later than Week 5. <u>The Online Tutorial is part of the subject completion requirement. Students who fail to complete the Online Tutorial will fail this subject.</u> This assessment method assesses the intended learning outcome 3.</p> <table border="1" data-bbox="499 1061 1445 1720"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>1. Mini-project: research proposal, research paper</td> <td>45</td> <td>√</td> <td>√</td> <td></td> <td>√</td> <td>√</td> <td></td> </tr> <tr> <td>2. Mini-conference: Oral and poster presentations, paper reviews</td> <td>45</td> <td></td> <td></td> <td></td> <td></td> <td>√</td> <td>√</td> </tr> <tr> <td>3. Case study report – Significance of research</td> <td>10</td> <td></td> <td></td> <td>√</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total</td> <td>100 %</td> <td colspan="6"></td> </tr> </tbody> </table>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						1	2	3	4	5	6	1. Mini-project: research proposal, research paper	45	√	√		√	√		2. Mini-conference: Oral and poster presentations, paper reviews	45					√	√	3. Case study report – Significance of research	10			√				Total	100 %						
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Total	100 %																																														

	<p><u>Assessment:</u></p> <p>Continuous Assessment <span style="float: right;">100%</span></p> <p>Principal course assignments will include the following:</p> <ul style="list-style-type: none"> <li>• Students will go through the whole process of a research project in a mini-project. The problem can be a well known one and should be of student's interest. Student submissions for this mini-project may include <ul style="list-style-type: none"> <li>○ a research proposal</li> <li>○ the final research paper</li> </ul> </li> </ul> <p>Students also need to demonstrate they can use the tools taught in the class to prepare the research paper.</p> <ul style="list-style-type: none"> <li>• Students will participate in a mini-conference in which students will make oral and poster presentations of the research papers they developed in the mini-project. Students will also work as a reviewer of a conference to make critical comments to paper submissions.</li> <li>• Students will go through a critical analysis of the research they are carrying out to identify the significance in their project. Students are required to submit a case study report to discuss their findings.</li> </ul>	
<p><b>Student Study Effort Expected</b></p>	<p><b>Class contact:</b></p>	
	<ul style="list-style-type: none"> <li>▪ Lecture</li> </ul>	20 Hours
	<ul style="list-style-type: none"> <li>▪ Class activity</li> </ul>	19 Hours
	<p><b>Other student study effort:</b></p>	
	<ul style="list-style-type: none"> <li>▪ Self study / Mini-project</li> </ul>	66 Hours
	<p><b>Total student study effort</b></p>	
<p><b>Reading List and References</b></p>	<p><b>Indicative Reading</b></p> <ol style="list-style-type: none"> <li>1. Kristin Shrader-Frechette, Ethics of Scientific Research, Lanham, Md.: Rowman &amp; Littlefield, 1994.</li> <li>2. E. Bright Wilson, Jr., An Introduction to Scientific Research, New York: Dover Publications, 1990.</li> <li>3. Kenneth S. Bordens and Bruce B. Abbott, Research Design and Methods - A Process Approach, 8<sup>th</sup> Edition, McGraw Hill, 2008.</li> <li>4. John W. Creswell, Research Design – Qualitative, Quantitative, and Mixed Methods Approaches, SAGE, 2009.</li> <li>5. John W. Creswell, Dr. Vicki L. Plano Clark, Designing and Conducting Mixed Methods Research, SAGE, 2008.</li> <li>6. W. James Bradley and Kurt C. Schaefer, The Uses and Misuses of Data and Models: The Mathematization of the Human Science, SAGA Publications, Inc., 1998.</li> <li>7. Mark L. Mitchell and Janina M. Jolley, Research Design Explained, 6<sup>th</sup> Edition, Thomson Wadsworth, 2007.</li> <li>8. John D. Sterman, Business dynamics: Systems thinking and modeling for a complex world, McGraw-Hill, 2000.</li> </ol>	

**Subject Description Form**

<b>Subject Code</b>	EIE6207
<b>Subject Title</b>	Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing
<b>Credit Value</b>	3
<b>Level</b>	6
<b>Pre-requisite / Co-requisite/ Exclusion</b>	The student is expected to have background knowledge of University Mathematics in his/her 1st and/or 2nd year of undergraduate studies. In particular, s/he is expected to have a fundamental understanding of basic statistics, calculus, signals and linear system.
<b>Objectives</b>	The subject covers background mathematical techniques and application examples applicable to advanced multimedia, signal and information processing; in particular in the areas of image processing, video technology, speech and audio processing, pattern recognition, telecommunications, opto-electronics and acoustics. After the completion of this subject, the student should acquire some good engineering approaches, mathematical and optimization techniques to carry out academic research and hi-tech R&D work in the above areas.
<b>Intended Learning Outcomes</b>	<p><b>Upon completion of the subject, students will be able:</b></p> <p>Category I: Professional/academic knowledge and skills</p> <ol style="list-style-type: none"> <li>1. to (i) understand the theories behind the subject materials and be able to apply them for research and practical applications; (ii) understand the structure of Matrix Analysis, Basic Probability and Statistical Signal Processing, and (iii) make use of the above techniques for the optimization of different types of signals, measures and representations.</li> <li>2. to master these advanced/essential techniques for hi-tech engineering work or research work on signal prediction, estimation and analysis, and</li> <li>3. to learn fast realisation structures and algorithms for state-of-the-art multimedia, information and communication applications, that can equip an engineer to accept hi-tech design/realization challenge in the future.</li> </ol> <p>Category II: Attributes for all-roundedness</p> <ol style="list-style-type: none"> <li>4. to present ideas and findings effectively.</li> <li>5. to think critically.</li> <li>6. to learn independently.</li> </ol>



**Subject Synopsis/  
Indicative Syllabus**

**A: Matrix Fundamentals, Analysis and Applications:**

This part gives the basic matrix formulation applicable to image, video, and speech processing; multimedia, communication, optical, wireless, and intelligent systems.

**1. Matrix fundamentals**

- (i) Sets of linear equations.
- (ii) Basic matrix algebra / row reduction.
- (iii) Transpose / trace / determinant / inverse / rank of a matrix.
- (iv) Eigenvalues and eigenvectors.
- (v) Diagonalization of matrices.
- (vi) Change of basis and similarity transformations.
- (vii) Generalized eigenvectors/eigenvalues.

**2. Matrix analysis**

- (i) Jordan canonical, Quadratic and Hermitian forms.
- (ii) Matrix norms.
- (iii) Functions of matrices.
- (iv) State-space representation.
- (v) Solution of the state equation.

**3. Matrix sample applications**

A large number of possible applications are available by making use of the above matrix techniques for image and video processing, pattern recognition, communications and information processing. At least two applications, should be covered, for example

- (i) KL transform for compression making use of diagonalization of matrices.
- (ii) Face recognition making use of eigenvalue representation.

**B: Probability and Statistical Signal Processing**

This part covers the probability and statistical signal processing techniques applicable for image, video and speech processing, optical and wireless communications, and intelligent systems.

**4. Basic Probability and Concept of Stochastic Processes**

- (i) Functions of random variables.
- (ii) Multivariate Gaussian distributions (including complex-value Gaussian distributions).
- (iii) Non-Gaussian distributions (e.g., Cauchy distribution, symmetric alpha stable distributions).
- (iv) Power spectral density.
- (v) Wide-sense stationarity, strict sense stationarity, cyclo- stationarity.
- (vi) Filtering of stochastic processes (1).

**5. Stochastic Processes and Prediction**

- (i) Filtering of stochastic processes (2).
- (ii) Maximum likelihood estimation.
- (iii) Estimation bias and consistency.
- (iv) Cramer-Rao bound and estimation efficiency.
- (v) Bayesian (MAP) estimation.
- (vi) Minimum mean square error (MMSE) estimation.
- (vii) Hypothesis testing.
- (viii) Neyman-Pearson detection.

- (ix) Generalized likelihood ratio test.
- (x) Bayesian detection.

## 6. Probability and Statistical Signal Processing Applications

A large number of possible applications are available by making use of the Probability and Statistical Signal Processing techniques for communications, information processing and other applications. At least two applications, should be covered, for example

- (i) Data or image or video interpolation making use of stochastic filtering approaches.
- (ii) Noise reduction in communication channel.

## C: Engineering approaches for Optimization, Classifications, and Estimation

This part gives some most commonly used engineering techniques for optimization, classifications and estimation, for research and hi-tech development in multi-media systems, communications and information processing.

## 7. Basic Optimization using Gradient Descent and Least Square

- (i) **Calculus optimization method: Lagrange Multipliers**, One equality constraint, Multiple equality constraints and, Inequality constraints.
- (ii) **Analytical optimization method: Gradient Descent**, Solution of a linear system, Solution of a non-linear system.
- (iii) **Statistical optimization method: Least Squares Optimization**, Ordinary Least Squares, Weighted least squares, Regularized least squares.

## 8. Basic Clustering and Classification

- (i) **Clustering methods: K-means Clustering**, Algorithm, Sample applications: vector quantization, feature (dictionary) learning.
- (ii) **Classification and regression method: Decision Trees (Classification and Regression Trees)**, A general tree structure, training procedures, testing procedures, Classification tree, Regression tree.

Sample applications: object recognition, scene classification, pose estimation...

- (i) **Dimension reduction method: Principal Component Analysis (PCA)**, principal components computation, characteristics of principal components.

Sample applications: face recognition.

## 9. Prediction and Hidden Markov Model

**Random Signal Processing and State Estimation, Kalman filter, Hidden Markov Model**: Kalman filter, matrix-vector algebra, probability, extracting estimates from observations, state estimation, system prediction.

Sample applications: noise removal and/or object tracking.

<b>Teaching/Learning Methodology</b>	<p><u>Lectures:</u></p> <p>Matrix Analysis, Basic Probability, Statistical Signal Processing, optimization and classification techniques for multimedia communication systems are delivered to students.</p> <p><u>Tutorials:</u></p> <p>Students will be able to clarify concepts and to have a deeper understanding of the lecture material via tutorial questions; problems and application examples are given and discussed.</p> <p><u>Home Work Assignment (Essay writing and Presentation):</u></p> <p>Each student is required to write an essay on an advanced topic, either on an advanced theory, optimization or application example. The student has to make a presentation of his/her essay in front of his/her classmates &amp; be an assessor of other students.</p> <table border="1" data-bbox="502 712 1428 1041"> <thead> <tr> <th rowspan="2">Teaching/Learning Methodology</th> <th colspan="6">Intended Subject Learning Outcomes</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>Tutorials</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Self-learning/report/presentation</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </tbody> </table>							Teaching/Learning Methodology	Intended Subject Learning Outcomes						1	2	3	4	5	6	Lectures	✓	✓	✓	✓	✓		Tutorials	✓	✓	✓		✓	✓	Self-learning/report/presentation	✓	✓	✓	✓	✓	✓																				
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Tutorials	✓	✓	✓		✓	✓																																																							
Self-learning/report/presentation	✓	✓	✓	✓	✓	✓																																																							
<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	<table border="1" data-bbox="502 1108 1428 1624"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <tr> <td>1. Tests</td> <td>25%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>2. Quiz</td> <td>10%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td>✓</td> <td></td> </tr> <tr> <td>3. Assignments</td> <td>15%</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>4. Examination</td> <td>50%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100%</td> <td colspan="6"></td> </tr> </tbody> </table>							Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)						1	2	3	4	5	6	1. Tests	25%	✓	✓	✓	✓	✓		2. Quiz	10%	✓	✓	✓		✓		3. Assignments	15%	✓		✓	✓	✓	✓	4. Examination	50%	✓	✓	✓	✓	✓	✓	Total	100%						
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1. Tests	25%	✓	✓	✓	✓	✓																																																							
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3. Assignments	15%	✓		✓	✓	✓	✓																																																						
4. Examination	50%	✓	✓	✓	✓	✓	✓																																																						
Total	100%																																																												
<b>Student Study Effort Expected</b>	<b>Class contact:</b>																																																												
	<ul style="list-style-type: none"> <li>▪ Lecture</li> </ul>						20 Hours																																																						
	<ul style="list-style-type: none"> <li>▪ Tutorial</li> </ul>						19 Hours																																																						
	<b>Other student study effort:</b>																																																												
	<ul style="list-style-type: none"> <li>▪ Self-study, assignment, write-up, presentation</li> </ul>						63 Hours																																																						
	<b>Total student study effort</b>						102 Hours																																																						

**Reading List and  
References**

**References:**

1. Probability and Random Processes for Electrical and Computer Engineers, by John A. Gubner, Cambridge University Press, 2006.
2. Data Mining and Analysis, Fundamental Concepts and Algorithms, by M.J. Zaki and W. Meira Jr., Cambridge University Press, 2014.
3. Applied Statistics and Probability for Engineers, D.C. Montgomery and G.C. Runger, 2014.
4. Proakis, Rader, Ling and Nikias, Advanced Digital Signal Processing, Macmillan Publishing Co., 1992.
5. V Britanak, P. Yip and R. Rao, Discrete Cosine and Sine Transforms, Academic Press, Inc., 2007.
6. Introduction to Linear Algebra, Gilbert Strang, 2009.
7. Computational Science and Engineering, Gilber Strang, 2007.
8. Lagrange Multiplier. (2015, May 2). In Wikipedia, The Free Encyclopedia. Retrieved 07:35, May 19, 2015, from [http://en.wikipedia.org/w/index.php?title=Lagrange\\_multiplier&oldid=660453480](http://en.wikipedia.org/w/index.php?title=Lagrange_multiplier&oldid=660453480)
9. Gradient Descent. (2015, April 20). In Wikipedia, The Free Encyclopedia. Retrieved 07:31, May 19, 2015, from [http://en.wikipedia.org/w/index.php?title=Gradient\\_descent&oldid=657306125](http://en.wikipedia.org/w/index.php?title=Gradient_descent&oldid=657306125)
10. Hidden Markov Model. (2015, May 18). In Wikipedia, The Free Encyclopedia. Retrieved 07:38, May 19, 2015, from [http://en.wikipedia.org/w/index.php?title=Hidden\\_Markov\\_model&oldid=62863015](http://en.wikipedia.org/w/index.php?title=Hidden_Markov_model&oldid=62863015)

Selected reading from recent issues of IEEE Transactions on Image Processing, Pattern Analysis and Machine Intelligence, Circuits and System for Video Technology, Signal Processing; Pattern Recognition, Proceedings of ICASSP, ICIP, CVPR and IRE Proceedings (2008–2015).

### Subject Description Form

<b>Subject Code</b>	EIE604 – EIE606
<b>Subject Title</b>	Special Topics in Advanced Communications Systems I/II/III
<b>Credit Value</b>	3
<b>Level</b>	6
<b>Pre-requisite / Co-requisite / Exclusion</b>	Students are expected to have acquired knowledge in digital communications equivalent to that taught in the final year of an Honours Degree in Electronic/Electrical/Information Engineering.
<b>Objectives</b>	This subject aims to equip students with the comprehensive knowledge in advanced communications systems and their state-of-the-art technologies.
<b>Intended Learning Outcomes</b>	<p><b>Upon completion of the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. understand the state-of-the-art developments and trends in advanced communications systems;</li> <li>2. familiarize themselves with the technical knowhow and the tools for the analysis and design of selected advanced communications systems.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p>Topic for guided study is selected from one or more of the following:</p> <ul style="list-style-type: none"> <li>• Wireless Communications</li> <li>• Wireless Networking</li> <li>• Communication Theory</li> <li>• Signal Processing for Communications</li> <li>• Optical Networks and Systems</li> <li>• Next-Generation Networking</li> <li>• Communication QoS, Reliability &amp; Modeling</li> <li>• Ad-hoc and Sensor Networking</li> <li>• Communication Software and Services</li> <li>• Communication and Information Systems Security</li> <li>• Cognitive Radio and Networks</li> </ul>
<b>Teaching/Learning Methodology</b>	<p>The subject can be conducted via guided study in two modes for individual students. <u>Mode I</u> 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. <u>Mode II</u> 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 once per week 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.</p>

	Alignment of learning & teaching activities with the ILOs (Mode I)			
<b>Teaching/Learning Methodology</b>	<b>Intended subject learning outcomes</b>			
	<b>1</b>	<b>2</b>		
1. Lectures	✓	✓		
2. Tutorials / Laboratories	✓	✓		
3. Literature survey	✓	✓		
4. Write-ups and presentations	✓	✓		
<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	Alignment of learning & teaching activities with the ILOs (Mode II)			
	<b>Teaching/Learning Methodology</b>	<b>Intended subject learning outcomes</b>		
		<b>1</b>	<b>2</b>	
	5. Literature survey	✓	✓	
	6. Write-ups and presentations	✓	✓	
	<b>Specific assessment methods/tasks</b>	<b>% weighting</b>	<b>Intended subject learning outcomes to be assessed</b>	
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			
For Model I study, the Coursework part will include the coursework of the MSc subject and the coursework of the additional study assigned by the teaching staff. The Examination part will include the examination of the MSc subject, and the written and oral examination of the additional study assigned by the teaching staff.				
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.				

<b>Student Study Effort Expected (Mode I)</b>	<b>Class contact (time-tabled):</b>	
	▪ Lecture	24 Hours
	▪ Tutorial/Laboratory/Practical Classes	15 Hours
	<b>Guided activities:</b>	
	▪ Meeting with the supervisor / Presentations/ Viva examination	10 Hours
	▪ Self-study / Preparation of reports and presentation materials	56 Hours
	<b>Total student study effort</b>	105 Hours
<b>(Mode II)</b>	<b>Guided activities:</b>	
	▪ Meeting with the supervisor / Presentations/ Viva examination	20 Hours
	▪ Self-study / Preparation of reports and presentation materials	85 Hours
		<b>Total student study effort</b>
<b>Reading List and References</b>	To be assigned by the teaching staff.	

**Subject Description Form**

<b>Subject Code</b>	EIE607 – EIE609
<b>Subject Title</b>	Special Topics in Advanced Power Electronics I/II/III
<b>Credit Value</b>	3
<b>Level</b>	6
<b>Pre-requisite / Co-requisite / Exclusion</b>	Students are expected to have acquired knowledge in power electronics equivalent to that taught in the final year of an Honours Degree in Electronic/Electrical/Information Engineering.
<b>Objectives</b>	This subject aims to equip students with the comprehensive knowledge and the state-of-the-art technologies in advanced power electronics and their applications.
<b>Intended Learning Outcomes</b>	<p><b>Upon completion of the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. understand the state-of-the-art developments and trends in advanced power electronics;</li> <li>2. familiarize themselves with the technical knowhow and the tools for the analysis and design of selected advanced power electronics systems.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p>Topic for guided study is selected from one or more of the following:</p> <ul style="list-style-type: none"> <li>• Power semiconductors, Power integrated circuits (PIC), passive components and packaging technologies</li> <li>• Motor drives and motion control</li> <li>• Analysis and design of electrical machines</li> <li>• Hard-switching and soft-switching static power converters and UPS</li> <li>• Applications of power electronics in power system and generation/FACTS</li> <li>• Power quality issues, harmonic problems and solutions</li> <li>• EMI/EMC issues</li> <li>• Traction and automotive systems</li> <li>• Applications of power electronics in home appliance, industry and aerospace</li> <li>• Renewable energy technologies</li> <li>• Distributed generation and smart-grid</li> <li>• Modelling and simulation in power electronics</li> <li>• Power electronics related education/professional development</li> <li>• Bio-medical power electronics</li> <li>• Telecommunications power supplies</li> <li>• Micro-electromechanical systems (MEMS)</li> <li>• Power electronic emerging technologies</li> </ul>



<p><b>Teaching/Learning Methodology</b></p>	<p>The subject can be conducted via guided study in two modes for individual students. <u>Mode I</u> 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. <u>Mode II</u> 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 once per week 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.</p>																				
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<b>Student Study Effort Expected (Mode I)</b>	<b>Class contact (time-tabled):</b>	
	▪ Lecture	24 Hours
	▪ Tutorial/Laboratory/Practical Classes	15 Hours
	<b>Guided activities:</b>	
	▪ Meeting with the supervisor / Presentations/ Viva examination	10 Hours
	▪ Self-study / Preparation of reports and presentation materials	56 Hours
	<b>Total student study effort</b>	105 Hours
<b>(Mode II)</b>	<b>Guided activities:</b>	
	▪ Meeting with the supervisor / Presentations/ Viva examination	20 Hours
	▪ Self-study / Preparation of reports and presentation materials	85 Hours
		<b>Total student study effort</b>
<b>Reading List and References</b>	To be assigned by the teaching staff.	

### Subject Description Form

<b>Subject Code</b>	EIE613 – EIE615
<b>Subject Title</b>	Special Topics in Multimedia Signal Processing I/II/III
<b>Credit Value</b>	3
<b>Level</b>	6
<b>Pre-requisite / Co-requisite / Exclusion</b>	Students are expected to have acquired knowledge in digital signal processing equivalent to that taught in the final year of an Honours Degree in Electronic Engineering/Electrical/Information Engineering.
<b>Objectives</b>	This subject aims to equip the students with the comprehensive knowledge and the state-of-the-art technologies in multimedia signal processing and their applications.
<b>Intended Learning Outcomes</b>	<p><b>Upon completion of the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. understand the state-of-the-art developments and trends in multimedia signal processing;</li> <li>2. familiarize themselves with the technical knowhow and the tools for the analysis and design of selected multimedia signal processing systems.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p>Topic for guided study is selected from one or more of the following:</p> <ul style="list-style-type: none"> <li>• Coding and compression of multimedia signals</li> <li>• Multimedia for communication and collaboration</li> <li>• Multimedia database and data retrieval</li> <li>• Multimedia forensics</li> <li>• Client-cloud multimedia systems, applications, and experiences</li> <li>• Virtual reality signal processing</li> <li>• Scene analysis</li> <li>• Multimedia networking</li> <li>• Emerging topics in multimedia signal processing</li> </ul>
<b>Teaching/Learning Methodology</b>	<p>The subject can be conducted via guided study in two modes for individual students. <u>Mode I</u> 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. <u>Mode II</u> 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 once per week 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.</p>

	Alignment of learning & teaching activities with the ILOs (Mode I)		
<b>Teaching/Learning Methodology</b>	<b>Intended subject learning outcomes</b>		
	<b>1</b>	<b>2</b>	
1. Lectures	✓	✓	
2. Tutorials / Laboratories	✓	✓	
3. Literature survey	✓	✓	
4. Write-ups and presentations	✓	✓	
<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	Alignment of learning & teaching activities with the ILOs (Mode II)		
	<b>Teaching/Learning Methodology</b>	<b>Intended subject learning outcomes</b>	
		<b>1</b>	<b>2</b>
	5. Literature survey	✓	✓
	6. Write-ups and presentations	✓	✓
	<b>Specific assessment methods/tasks</b>	<b>% weighting</b>	<b>Intended subject learning outcomes to be assessed</b>
	<b>1</b>		<b>2</b>
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		
For Model I study, the Coursework part will include the coursework of the MSc subject and the coursework of the additional study assigned by the teaching staff. The Examination part will include the examination of the MSc subject, and the written and oral examination of the additional study assigned by the teaching staff.			
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<b>Student Study Effort Expected (Mode I)</b>	<b>Class contact (time-tabled):</b>	
	▪ Lecture	24 Hours
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<b>(Mode II)</b>	<b>Guided activities:</b>	
	▪ Meeting with the supervisor / Presentations/ Viva examination	20 Hours
	▪ Self-study / Preparation of reports and presentation materials	85 Hours
		<b>Total student study effort</b>
<b>Reading List and References</b>	To be assigned by the teaching staff.	

### Subject Description Form

<b>Subject Code</b>	EIE616 – EIE618
<b>Subject Title</b>	Special Topics in Biosensor Technologies I/II/III
<b>Credit Value</b>	3
<b>Level</b>	6
<b>Pre-requisite / Co-requisite / Exclusion</b>	Students are expected to have acquired knowledge in biomedical engineering or bio-electronics equivalent to that taught in the final year of an Honours Degree in Electronic/Electrical/Information Engineering.
<b>Objectives</b>	This subject aims to equip the students with the comprehensive knowledge and the state-of-the-art technologies in biosensor technologies and their applications.
<b>Intended Learning Outcomes</b>	<p><b>Upon completion of the subject, students will be able to:</b></p> <ol style="list-style-type: none"> <li>1. understand the state-of-the-art developments and trends in biosensor technologies;</li> <li>2. familiarize themselves with the technical knowhow and the tools for the analysis and design of selected biosensor systems.</li> </ol>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p>Topic for guided study is selected from one or more of the following:</p> <ul style="list-style-type: none"> <li>• Bioelectronics</li> <li>• Commercial biosensors, manufacturing and markets</li> <li>• DNA chips, nucleic acid sensors and aptasensors</li> <li>• Enzyme-based biosensors</li> <li>• Immunosensors</li> <li>• Lab-on-a-chip</li> <li>• Microfluidics and immobilisation technology</li> <li>• Nanobiosensors, nanomaterials &amp; nanoanalytical systems</li> <li>• Natural &amp; synthetic receptors (including MIPs)</li> <li>• Organism- and whole cell-based biosensors</li> <li>• Printed biosensors and micro- and nanofabrication</li> <li>• Proteomics, single-cell analysis and cancer-cell detection</li> <li>• Imaging and fluorescence</li> <li>• Signal transduction technology</li> <li>• Signal conditioning and measurement certainty</li> <li>• Theranostics &amp; implantable sensors</li> </ul>

<p><b>Teaching/Learning Methodology</b></p>	<p>The subject can be conducted via guided study in two modes for individual students. <u>Mode I</u> 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. <u>Mode II</u> 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 once per week 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.</p>																				
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