THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

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

(Full-Time: 42601-FD/42601-FTD/42601-FTM /
Part-Time: 42601-PD/42601-PTD/42601-PTM)

Programme Booklet (2022/23)

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: 42601-FD/42601-FTD/42601-FTM /
PART-TIME: 42601-PD/42601-PTD/42601-PTM)

Contents

This Programme Booklet is subject to review and changes by the Department 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 RPg Programmes" and the "Research Postgraduate Student Handbook" available at Graduate School's website (https://www.polyu.edu.hk/gs/) .

1. GENERAL INFORMATION

1.1 Cohort of Intakes and Readership

This programme booklet is the programme document for the 2022/23 cohort. Just in case any updated information is necessary after the publication of this booklet, students are requested to refer to the EIE departmental website (https://www.polyu.edu.hk/eie/) 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

Title of Programme	**Doctor of Philosophy (PhD) / Master of Philosophy (MPhil)**
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

1.3 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.

1.3.1 The normal periods of study are as follows:

	MPhil	PhD	
Full-time	2 years	3 years	(4 years for students admitted on the basis of a Bachelor's degree)
Part-time	4 years	6 years	(8 years for students admitted on the basis of a Bachelor's degree)
Joint PhD Full-time		Normally, 4 years^* (2+2 structure)	

^ *Regardless of the student's entry qualification.*

* *The exact normal period of study may vary depending on the respective partnership agreement for joint PhD supervision leading to dual awards.*

1.3.2 The maximum periods of study are as follows:

	MPhil	PhD	
Full-time	3 years	5 years	(6 years for students admitted on the basis of a Bachelor's degree)
Part-time	5 years	7 years	(9 years for students admitted on the basis of a Bachelor's degree)
Joint PhD Full-time		Normally, 6 years^*	

^ *Regardless of the student's entry qualification.*

* *The exact maximum period of study may vary depending on the respective partnership agreement for joint PhD supervision leading to dual awards.*

1.3.3 All the students must fulfil the residence requirement before thesis submission. The residence requirements are as follows:

	MPhil	PhD	
Full-time or Part-time	2 regular semesters	3 regular semesters	(4 regular semesters for students admitted on the basis of a Bachelor's degree)
Joint PhD Full-time		Normally, 6 consecutive semesters/terms (equivalent to 2 years) in PolyU*	(and 6 consecutive semesters/terms (equivalent to 2 years) at the partner institution)

* *The exact residence requirement may vary depending on the respective partnership agreement for joint PhD supervision leading to dual awards.*

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.

2.3 Relationship of Programme Aims to University Missions

The University has the following missions:

1. To pursue impactful research that benefits the world.
2. To nurture critical thinkers, effective communicators, innovative problem solvers and socially responsible global citizens.
3. To foster a University community in which all members can excel in their aspirations with a strong sense of belonging and pride.

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

Programme Aims	**University Missions**		
	1	2	3
1	√	√	√
2	√	√	√

2.4 Institutional Learning Outcomes

1. Research and Scholarship Excellence

MPhil graduates should demonstrate advanced competence in research methods, possess in-depth knowledge and skills in their area of study and attain the ability to apply their knowledge and act as leaders in analyzing and solving identified issues and problems in their area of study. They should also be able to disseminate/communicate effectively their research findings in publications, conferences and classrooms.

PhD graduates should demonstrate state-of-the-art expertise and knowledge in their area of study, possessed superior competence in research methodologies and contribute as leaders in creating new knowledge through analysis, diagnosis and synthesis. They should also be able to disseminate/communicate their research ideas and findings effectively and efficiently in publications, conferences and classrooms.

2. Originality

MPhil graduates will be versatile problem solvers with good mastery of critical and creative thinking methodologies. They can generate practical and innovative solutions to problems in their area of study.

PhD graduates will be able to think out of the box. They will be innovative problem solvers with excellent mastery of critical and creative thinking methodologies. They will create original solutions to issues and problems pertaining to their area of expertise and the society in general.

3. Lifelong Learning Capability

MPhil graduates will have an enhanced capability for continual professional development through inquiry and reflection on knowledge in their area of study.

PhD graduates will demonstrate the ability to engage in an enduring quest for knowledge and an enhanced capability for continual academic/professional development through self-directed research in their area of study.

2.5 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 to pursue a PhD degree (for MPhil graduates).

2.6 Relationship between Programme Outcomes and Programme Aims

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

Programme Outcomes	**Programme Aims**	
	1	**2**
1	√	
2	√	√
3	√	
4	√	√
5	√	
6	√	√
7		√

2.7 Relationship between the Programme Outcomes and Institutional Learning Outcomes

The following table illustrates the relationship between Programme Outcomes and Institutional Learning Outcomes:

Programme Outcomes	**Institutional Learning Outcomes**		
	1	**2**	**3**
1	√		
2	√	√	
3	√	√	
4	√	√	
5	√		
6	√		√
7			√

2.8 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 EIE6811 – EIE6813 EIE Guided Study Subjects	EIE621 – EIE623 EngD 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			√		√			√

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 EIE6811 – EIE6813 EIE Guided Study Subjects	EIE621 – EIE623 EngD Guided Study Subjects (Mode I)	EIE6201 – EIE6204 Research Seminar	EIE6205 – EIE6206 Practicum	Thesis and Oral Examination
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 and 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[Note 1], 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 paragraphs may be admitted. Such applicants may be required to pass an examination.

Note 1:

- To register for a 3-year full-time / 6-year part-time PhD programme, an applicant shall normally hold an MPhil or equivalent (a research postgraduate degree with a dissertation as an award requirement) conferred by a recognized university; and
- To register for a 4-year full-time / 8-year part-time PhD programme, an applicant shall normally hold:
  - a Master's degree; or
  - a Bachelor's degree with First Class Honours (or equivalent qualification), conferred by a recognised university.

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 in the International English Language Testing System (IELTS); or
- A Test of English as a Foreign Language (TOEFL) score of 80 or above for the Internet-based test or 550 or above for the paper-based test.

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

4. PROGRAMME, SUBJECTS, CREDITS AND REQUIREMENTS

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
	ONE elective from: EIE6207 Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing OR EIE Guided Study Subjects EIE6811 – EIE6813 OR EngD Guided Study Subjects EIE621 – EIE623 (Mode I: with accompanying MSc subject) OR Research postgraduate courses offered by PolyU or other universities	Elective	3
	Thesis	Compulsory	–
			Total: 9 credits

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</u> from: EIE Guided Study Subjects EIE6811 – EIE6813 OR EngD Guided Study Subjects EIE621 – EIE623 (Mode I: with accompanying MSc subject) OR Research postgraduate courses offered by PolyU or other universities	Elective	3
	Thesis	Compulsory	–
			Total: 15 credits

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
	THREE electives from: EIE Guided Study Subjects EIE6811 – EIE6813 OR EngD Guided Study Subjects EIE621 – EIE623 (Mode I: with accompanying MSc subject) *Students are allowed to take only ONE subject from this pool. OR Research postgraduate courses offered by PolyU or other universities	Elective	9
	Thesis	Compulsory	–
			Total: 22 credits

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. RPg students should discuss with their Chief Supervisors the relevance and suitability of the seminars before attending the seminars. The scope of a seminar attended by an RPg student should have significant research value to his/her study, enabling him/her to keep abreast of the latest discovery and enhancing his/her knowledge in the field(s). Proof of attendance should be presented for each of the seminar attended.

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/professional service 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 two practicum credits in two different semesters or within the same semester, subject to the approval of the Chief Supervisor. PhD students who are stipend recipients are **not** 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/professional service 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 and PhD students need to complete their coursework with a qualifying GPA of 2.7 or above before submission of their thesis for examination.

4.5 Credit Transfer

4.5.1 Credits which have already been used to contribute to a previous award should not be transferred to contribute to the MPhil/PhD award with the following exceptions:

a. all returning students will be allowed to transfer the grade obtained in the subject "HTI6081 Ethics: Research, Professional & Personal Perspectives" to the new RPg programme regardless of its level, provided that the grade was attained within five years of re-admission;

b. all 3-year full-time/6-year part-time PhD students will be allowed to transfer one credit from his/her previous attendance in seminars.

4.5.2 *Transfer of credits of subjects at postgraduate level earned from recognised previous studies*

Applications for the transfer of credits from recognised previous studies (Form GSB/33) will be endorsed by the DRC with justifications and approved by the HoD. Only credits gained from subjects at postgraduate level that have not been used to contribute to an award will be acceptable for transfer. The validity period for such credit transfer for research degree programmes is defined to be eight years from the year of attainment at the time of admission. The maximum number of credits transferrable for different categories of students is:

No more than 50% of the credit requirement of the programme disregarding whether the credits were earned within or outside PolyU.

4.5.3 Credits transferred from previous study outside the University will not be included in the calculation of the qualifying GPA.

4.5.4 *Transfer of credits taken at postgraduate level outside PolyU after admission*

a. Taking subjects outside PolyU during the student's research postgraduate studies in PolyU with prior approval is regarded as an acceptable way to gain credits. The student should submit an application (Form GSB/48), via his/her Chief Supervisor, to the General Office of Department to initiate the transfer. The application will be endorsed by the DRC Chair and approved by the HoD.

b. The transfer of grades will be in accordance with the grading table below and the grade gained will be included in the calculation of the qualifying GPA:

Grade	Grade Point	Short Description
A+	4.3	Excellent
A	4.0	
A-	3.7	
B+	3.3	Good
B	3.0	
B-	2.7	
C+	2.3	Satisfactory
C	2.0	
C-	1.7	
D+	1.3	Pass
D	1.0	
F	0.0	Failure

4.5.5 *Minimum number of credits with a letter grade*

An MPhil student must complete at least three credits with a letter grade and a PhD student at least six to allow for a meaningful calculation of the qualifying GPA.

4.6 Research Language Skills Assessment (RLSA) and English Enhancement Subjects

Students are required to take the Research Language Skills Assessment (RLSA) in their first semester of study offered by ELC. Based on their performance of the RLSA, students will need to take relevant subjects according to the following arrangement:

RLSA Performance[1]	**English Enhancement Subjects**
Band 1 in both Writing, and Speaking tasks	Exempted
Band 2 or above in both Writing, and Speaking tasks	ENGL6016: *Advanced Academic English for Research Students: Publishing and Presenting*
Band 3 or below in either Writing, or Speaking tasks	ELC6011 **and** ELC6012 ELC6011: *Presentation Skills for Research Students* ELC6012: *Thesis Writing for Research Students*

Note 1: Band 1 is the highest grade and Band 5 the lowest.

4.7 National Education Requirement

Starting from the 2022/23 intake cohort, all research students are required to complete the National Education Requirement before thesis submission as a graduation requirement. Students are encouraged to complete the requirement as early as possible. Details on the requirement are specified at: https://www.polyu.edu.hk/ous/nationaleducation/understanding-china-and-hongkong/.

5. SPECIFIED PROGRESSION PATTERN

5.1 Master of Philosophy (MPhil)

2-year Full-time / 4-year Part-time MPhil (9 credits)		
Year of study	**Compulsory**	**Elective**
FT Year 1 / PT Years 1 & 2		3 credits, i.e. 1 elective from: • EIE6207 Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing OR • EIE Guided Study Subjects # EIE6811 – EIE6813 OR • EngD Guided Study Subjects (Mode I: with accompanying MSc subject) # EIE621 – EIE623 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	
FT Year 2 / PT Years 3 & 4		
EIE6202 Research Seminar (II)	1 credit	
Thesis	–	NA
Total:	*6 credits*	*3 credits*

Please refer to the Guided Study Subject lists at the end of this section.

5.2 Doctor of Philosophy (PhD)

<table>
<tr><th colspan="3"><u>3-year Full-time / 6-year Part-time PhD (15 credits)</u></th></tr>
<tr><th>Year of study</th><th>Compulsory</th><th>Elective</th></tr>
<tr><td colspan="2">FT Year 1 / PT Years 1 & 2</td><td rowspan="10">3 credits, i.e. <u>1 elective</u> from:
• EIE Guided Study Subjects # EIE6811 – EIE6813
OR
• EngD Guided Study Subjects (Mode I: with accompanying MSc subject) # EIE621 – EIE623
OR
• Research postgraduate courses offered by PolyU or other universities</td></tr>
<tr><td>HTI6081 Ethics: Research, Professional & Personal Perspectives</td><td>1 credit</td></tr>
<tr><td>EIE6200 Methodology for Engineering and Scientific Research</td><td>3 credits</td></tr>
<tr><td>EIE6201 Research Seminar (I)</td><td>1 credit</td></tr>
<tr><td>EIE6205 Practicum (I)</td><td>1 credit</td></tr>
<tr><td>EIE6207 Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing</td><td>3 credits</td></tr>
<tr><td colspan="2">FT Year 2 / PT Years 3 & 4</td></tr>
<tr><td>EIE6202 Research Seminar (II)</td><td>1 credit</td></tr>
<tr><td>EIE6206 Practicum (II)</td><td>1 credit</td></tr>
<tr><td colspan="2">FT Year 3 / PT Years 5 & 6</td></tr>
<tr><td>EIE6203 Research Seminar (III)</td><td>1 credit</td></tr>
<tr><td>Thesis</td><td>–</td><td>NA</td></tr>
<tr><td>Total:</td><td>12 credits</td><td>3 credits</td></tr>
</table>

Please refer to the Guided Study Subject lists at the end of this section.

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

<table>
<tr><th colspan="3"><u>4-year Full-time / 8-year Part-time PhD (22 credits)</u></th></tr>
<tr><th>Year of study</th><th>Compulsory</th><th>Elective</th></tr>
<tr><td colspan="2">FT Year 1 / PT Years 1 & 2</td><td rowspan="15">9 credits, i.e. <u>3 electives</u> from:
• EIE Guided Study Subjects # EIE6811 – EIE6813
OR
• EngD Guided Study Subjects (Mode I: with accompanying MSc subject) # EIE621 – EIE623
*<u>Students are allowed to take only 1 subject from this pool</u>.
OR
• Research postgraduate courses offered by PolyU or other universities</td></tr>
<tr><td>HTI6081 Ethics: Research, Professional & Personal Perspectives</td><td>1 credit</td></tr>
<tr><td>EIE6200 Methodology for Engineering and Scientific Research</td><td>3 credits</td></tr>
<tr><td>EIE6201 Research Seminar (I)</td><td>1 credit</td></tr>
<tr><td>EIE6205 Practicum (I)</td><td>1 credit</td></tr>
<tr><td>EIE6207 Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing</td><td>3 credits</td></tr>
<tr><td colspan="2">FT Year 2 / PT Years 3 & 4</td></tr>
<tr><td>EIE6202 Research Seminar (II)</td><td>1 credit</td></tr>
<tr><td>EIE6206 Practicum (II)</td><td>1 credit</td></tr>
<tr><td colspan="2">FT Year 3 / PT Years 5 & 6</td></tr>
<tr><td>EIE6203 Research Seminar (III)</td><td>1 credit</td></tr>
<tr><td colspan="2">FT Year 4 / PT Years 7 & 8</td></tr>
<tr><td>EIE6204 Research Seminar (IV)</td><td>1 credit</td></tr>
<tr><td>Thesis</td><td>–</td><td>NA</td></tr>
<tr><td>Total:</td><td>13 credits</td><td>9 credits</td></tr>
</table>

Please refer to the Guided Study Subject lists at the end of this section.

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.

 # Guided Study Subject lists

EIE Guided Study Subjects

- EIE6811 Guided Study in Electronic and Information Engineering I
- EIE6812 Guided Study in Electronic and Information Engineering II
- EIE6813 Guided Study in Electronic and Information Engineering III

EngD Guided Study Subjects (Mode I: with accompanying MSc subject)

- EIE621 Special Topics in Electronic and Information Engineering I
- EIE622 Special Topics in Electronic and Information Engineering II
- EIE623 Special Topics in Electronic and Information Engineering III

6. ASSESSMENT REGULATIONS

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

7. SYLLABI (Please see pages 21 to 37)

Subject Description Form

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

Assessment Methods in Alignment with Intended Learning Outcomes

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	60 %	√		√			√
2. Oral presentation	25%					√	√
3. Attendance	15%			√			
Total	100 %						

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

1. Discipline specific scenario/case study analysis will assess the 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 individuals, professions and societies benefit from following ethically acceptable behavior and practices.

2. Oral presentations will assess the students' ability to present and argue points in support of their rationale.

Student Study Effort Required

Class contact:	
▪ Lecture/seminar/workshop/oral presentation	16 Hours
Other student study efforts:	
▪ Self-study and group work	27.5 Hours
▪ Assignment preparation	15 Hours
Total student study effort	58.5 Hours

Reading List and References

Materials from the Hong Kong Ethics development website (http://www.icac.org.hk/hkedc/eng/library2.asp)

Materials from EthicsWeb.ca (http://www.ethicsweb.ca/resources/professional/issues.html)

Selected readings and videos

Declaration of Helsinki (revised 2008)

Subject Description Form

Subject Code	EIE6200
Subject Title	Methodology for Engineering and Scientific Research
Credit Value	3
Level	6
Pre-requisite / Co-requisite / Exclusion	Nil
Objectives	This subject aims to equip students with the methodologies necessary for conducting engineering and scientific research. The objectives of this subject include: (i) To enable students to have a broad concept on the philosophy of research (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 (iii) To familiarize students with the methods for validating and presenting research results
Intended Learning Outcomes	Upon completion of the subject, students will be able to: 1. identify and select appropriate research problems; 2. formulate research objectives, analyze the problem, state hypotheses; 3. identify the safety and ethical issues in a research study; 4. identify, select appropriate research methods and develop process for conducting research; 5. appreciate published literature and write research paper; and 6. make professional presentations of research results and defend the propositions and claims.
Subject Synopsis/ Indicative Syllabus	Keyword Syllabus This subject provides students with the following key topics: 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. 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. 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.

<table>
<tr><td></td><td>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.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>

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. The Online Tutorial is part of the subject completion requirement. Students who fail to complete the Online Tutorial will fail this subject.
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.
A workshop will be given to familiarize students the tools for preparing research documents. It supports the intended learning outcome 6.
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 an oral presentation of the papers they developed in the mini-project. They support the intended learning outcome 1 to 6.

</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
In addition to the assessment methods below, the students are required to complete the “Online Tutorial on Academic Integrity” not later than Week 5. The Online Tutorial is part of the subject completion requirement. Students who fail to complete the Online Tutorial will fail this subject. This assessment method assesses the intended learning outcome 3.
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>1. Mini-project: research proposal, research paper, oral presentation</td><td>70</td><td>√</td><td>√</td><td></td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Report – Impact of research</td><td>15</td><td>√</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3. Case study – Research Ethics in Engineering</td><td>15</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>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td colspan="2">Assessment:

Continuous Assessment 100%

Principal course assignments will include the following:

• 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
o a research proposal
o the final research paper
Students also need to demonstrate they can use the tools taught in the class to prepare the research paper.
• Students will participate in a mini-conference in which students will make an oral presentation of the research papers they developed in the mini-project.
• 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 report.
• Students will conduct a case study on engineering ethics and present the details to classmates.</td></tr>
<tr><td rowspan="6">Student Study Effort Expected</td><td>Class contact:</td><td></td></tr>
<tr><td>▪ Lecture</td><td>20 Hours</td></tr>
<tr><td>▪ Class activity</td><td>19 Hours</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Self study / Mini-project</td><td>66 Hours</td></tr>
<tr><td>Total student study effort</td><td>105 Hours</td></tr>
<tr><td>Reading List and References</td><td colspan="2">Indicative Reading
1. Kristin Shrader-Frechette, Ethics of Scientific Research, Lanham, Md.: Rowman & Littlefield, 1994.
2. E. Bright Wilson, Jr., An Introduction to Scientific Research, New York: Dover Publications, 1990.
3. Kenneth S. Bordens and Bruce B. Abbott, Research Design and Methods - A Process Approach, 8th Edition, McGraw Hill, 2008.
4. John W. Creswell, Research Design – Qualitative, Quantitative, and Mixed Methods Approaches, SAGE, 2009.
5. John W. Creswell, Dr. Vicki L. Plano Clark, Designing and Conducting Mixed Methods Research, SAGE, 2008.
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.
7. Mark L. Mitchell and Janina M. Jolley, Research Design Explained, 6th Edition, Thomson Wadsworth, 2007.
8. John D. Sterman, Business dynamics: Systems thinking and modeling for a complex world, McGraw-Hill, 2000.</td></tr>
</table>

Subject Description Form

Subject Code	EIE6207
Subject Title	Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	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 systems.
Objectives	The subject covers mathematical techniques and application examples applicable to electronic and information engineering, particularly in the areas of image and video technology, speech and audio processing, pattern recognition, telecommunications, opto-electronics, acoustics, and electronic circuits. 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.
Intended Learning Outcomes	**Upon completion of the subject, students will be able:** Category I: Professional/academic knowledge and skills 1. to understand the theories behind the subject materials and be able to apply them for research and practical applications, including (i) matrix fundamentals, analysis and applications, (ii) probability and statistical signal processing, and (iii) engineering approaches for optimization, classifications, and estimation. 2. to master these advanced/essential techniques for modern engineering or research work, and 3. to develop efficient realization algorithms or systems for electronic and information engineering applications, which enable them to accept modern design/realization challenges in the future. Category II: Attributes for all-roundedness 4. to present ideas and findings effectively. 5. to think critically. 6. to learn independently.

Subject Synopsis/ Indicative Syllabus	**1. Matrix Analysis** • Overview of linear algebra • Eigenvalues and eigenvectors • Diagonalization of matrices • Change of basis and similarity transformations • Generalized eigenvectors/eigenvalues • Exponential function of matrix • Pseudo-inverse for non-square matrix • Singular value decomposition • Jordan canonical, Quadratic and Hermitian forms • Matrix norms and their properties • Functions of matrices • State-space representation • Solution of the state equation • Controllability and observability **2. Applications of Matrix Analysis** • Network/traffic flow analysis • Leontief input-output model analysis • Matrix fundamentals for election analysis. • Transformation, data fitting and data compression using singular value decomposition. • The controller designs using state-space methods. **3. Probability and Stochastic Processes** • Functions of random variables • Multivariate Gaussian distributions • Power spectral density • Wide-sense stationarity, strict sense stationarity. **4. Estimation and Prediction** • Maximum likelihood and Bayesian estimation. • Minimum mean square error (MMSE) estimation. • Kalman filtering **5. Machine Learning and Deep Learning** • Constrained Optimization o Equality and inequality constraints o Duality o Lagrange multipliers o Support vector machines • Clustering o K-means algorithm o Gaussian mixture models o EM Algorithm • Subspace Modeling o Principal component analysis o Linear discriminant analysis o Factor analysis • Bayesian Methods o Bayes theorem o Bayesian inference o Bayes classifiers • Deep Learning and deep neural networks o Deep neural networks o Convolutional neural networks o Stochastic gradient descent and backpropagation o Feature learning o Recurrent neural networks and LSTM

Teaching/Learning Methodology

Lectures:

Matrix analysis, probability, statistical signal processing, optimization, machine learning and deep learning are delivered to students.

Tutorials:

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.

Lab Exercises:

In the lab exercises, students will have the chance to apply the deep learning concepts they learn in lectures to build AI systems. In particular, they will construct and evaluate a handwritten digit recognition system using the Nvidia Jetson TX2 Developer Kit. Students will also use the kit and a webcam to perform real-time object recognition and handwritten digit recognition. Students need to submit a lab report to discuss their findings and observations.

Teaching/Learning Methodology	**Intended Subject Learning Outcomes**					
	1	**2**	**3**	**4**	**5**	**6**
Lectures	✓	✓	✓		✓	✓
Tutorials	✓	✓	✓		✓	✓
Labs	✓	✓	✓	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/ tasks*	**% weighting**	**Intended subject learning outcomes to be assessed (Please tick as appropriate)**					
		1	**2**	**3**	**4**	**5**	**6**
1. Test	20%	✓	✓			✓	✓
2. Examination	60%	✓	✓			✓	
3. Lab	20%	✓	✓	✓	✓	✓	✓
Total	100%						

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hours
▪ Tutorial	10 Hours
▪ Lab	3 Hours
Other student study effort:	
▪ Self-study and write-up	63 Hours
Total student study effort	102 Hours

Reading List and References	**References:** 1. M.W. Mak and J.T. Chien, *Machine Learning for Speaker Verification*, Cambridge University Press, 2020. 2. S.Y. Kung, M.W. Mak and S.H. Lin, *Biometric Authentication: A Machine Learning Approach*, Prentice Hall, 2005. 3. C. Bishop, *Pattern Recognition and Machine Learning*, Springer, 2006. 4. S.J.D. Prince, *Computer Vision: Models Learning and Inference*, Cambridge University Press, 2012. 5. M.W. Mak, "Lecture Notes on Factor Analysis and I-Vectors", *Technical Report and Lecture Note Series*, Department of Electronic and Information Engineering, The Hong Kong Polytechnic University, Feb. 2016. http://www.eie.polyu.edu.hk/~mwmak/papers/FA-Ivector.pdf 6. Sheldon Ross, *A First Course in Probability*, 6th Edition, Prentice Hall, 2002. (chapters 2 & 4-8) 7. R. D. Yates & D. J. Goodman, *Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers*, Prentice Hall, ISBN 0471178373. (chapters 6 & 10) 8. M. H. Hayes, *Statistical Digital Signal Processing and Modeling*, Wiley, 1996. ISBN-0-471-59431-8 (chapter 7.1-7.3) 9. M.J. Zaki and W. Meira Jr., *Data Mining and Analysis*, Fundamental Concepts and Algorithms, Cambridge University Press, 2014. 10. V. Britanak, P. Yip and R. Rao, *Discrete Cosine and Sine Transforms*, Academic Press, Inc., 2007. 11. G. Strang, *Introduction to linear algebra*, Vol. 3. Wellesley, MA: Wellesley-Cambridge Press, 1993. G. Strang, Introduction to Linear Algebra, 2009. 12. G. Strang, Computational Science and Engineering, 2007. 13. David C. Lay, Linear Algebra and its Applications, Fourth Edition, Pearson/Addison-Wesley, 2011. ISBN-13: 978-0321385178. 14. Roger A. Horn and Charles R. Johnson, Matrix Analysis, 2nd Edition, Cambridge University Press, 2012. 15. 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.

Subject Description Form

Subject Code	EIE6811 – EIE6813
Subject Title	Guided Study 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, microelectronics, 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, biosensor technologies and microelectronics.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. 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, biosensor technologies and microelectronics; b. 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 (A to E) selected by the student: A. Advanced communications systems • Wireless Communications • Wireless Networking • Communication Theory • Signal Processing for Communications • Optical Networks and Systems • Next-Generation Networking • Communication QoS, Reliability & Modeling • Ad-hoc and Sensor Networking • Communication Software and Services • Communication and Information Systems Security • Cognitive Radio and Networks B. Advanced power electronics • Power semiconductors, Power integrated circuits (PIC), passive components and packaging technologies • Motor drives and motion control • Analysis and design of electrical machines • Hard-switching and soft-switching static power converters and UPS • Applications of power electronics in power system and generation/FACTS • Power quality issues, harmonic problems and solutions • EMI/EMC issues • Traction and automotive systems • Applications of power electronics in home appliance, industry and aerospace

	• Renewable energy technologies • Distributed generation and smart-grid • Modelling and simulation in power electronics • Power electronics related education/professional development • Bio-medical power electronics • Telecommunications power supplies • Micro-electromechanical systems (MEMS) • Power electronic emerging technologies C. Multimedia signal processing • Coding and compression of multimedia signals • Multimedia for communication and collaboration • Multimedia database and data retrieval • Multimedia forensics • Client-cloud multimedia systems, applications, and experiences • Virtual reality signal processing • Scene analysis • Multimedia networking • Emerging topics in multimedia signal processing D. Biosensor technologies • Bioelectronics • Commercial biosensors, manufacturing and markets • DNA chips, nucleic acid sensors and aptasensors • Enzyme-based biosensors • Immunosensors • Lab-on-a-chip • Microfluidics and immobilisation technology • Nanobiosensors, nanomaterials & nanoanalytical systems • Natural & synthetic receptors (including MIPs) • Organism- and whole cell-based biosensors • Printed biosensors and micro- and nanofabrication • Proteomics, single-cell analysis and cancer-cell detection • Imaging and fluorescence • Signal transduction technology • Signal conditioning and measurement certainty • Theranostics & implantable sensors E. Microelectronics • Photovoltaic cells • Optoelectronic devices • Photonic devices • Organic electronics

<table>
<tr><td>Teaching/Learning Methodology</td><td>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.

<u>Alignment of learning & teaching activities with the ILOs</u>

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="2">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td></tr>
<tr><td>1. Literature survey</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Write-ups and presentations</td><td>✓</td><td>✓</td></tr>
</table></td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>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.

<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="2">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>a</td><td>b</td></tr>
<tr><td>1. Coursework
(normally assignments and presentations)</td><td>45</td><td>✓</td><td>✓</td></tr>
<tr><td>2. Examination
(normally both written and oral, conducted by the responsible staff and a staff member who is knowledgeable in the topic)</td><td>55</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100</td><td colspan="2"></td></tr>
</table></td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Guided activities:</td><td></td></tr>
<tr><td>▪ Meeting with the supervisor / Presentations/ Viva examination</td><td>20 Hrs.</td></tr>
<tr><td>▪ Self-study / Preparation of reports and presentation materials</td><td>85 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>105 Hrs.</td></tr>
</table></td></tr>
<tr><td>Reading List and References</td><td>Will be assigned by the teaching staff.</td></tr>
</table>

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: a. 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; b. 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 (A to D) selected by the student: A. Advanced communications systems • Wireless Communications • Wireless Networking • Communication Theory • Signal Processing for Communications • Optical Networks and Systems • Next-Generation Networking • Communication QoS, Reliability & Modeling • Ad-hoc and Sensor Networking • Communication Software and Services • Communication and Information Systems Security • Cognitive Radio and Networks B. Advanced power electronics • Power semiconductors, Power integrated circuits (PIC), passive components and packaging technologies • Motor drives and motion control • Analysis and design of electrical machines • Hard-switching and soft-switching static power converters and UPS • Applications of power electronics in power system and generation/FACTS • Power quality issues, harmonic problems and solutions • EMI/EMC issues • Traction and automotive systems

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

Student Study Effort Expected **(Mode I)**		
	Class contact (time-tabled):	
	▪ Lecture	24 Hrs.
	▪ Tutorial/Laboratory/Practical Classes	15 Hrs.
	Guided activities:	
	▪ Meeting with the supervisor / Presentations/ Viva examination	10 Hrs.
	▪ Self-study / Preparation of reports and presentation materials	56 Hrs.
	Total student study effort	105 Hrs.

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