THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

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

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

PROGRAMME DOCUMENT

Full-time: 46601-FD/FTD/FTM
Part-time: 46601-PD/PTD/PTM

PhD / MPhil in Electrical and Electronic Engineering
2023 – 2024

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

DOCTOR OF PHILOSOPHY (PHD) / MASTER OF PHILOSOPHY (MPHIL)
(FULL-TIME: 46601-FD/46601-FTD/46601-FTM / PART-TIME: 46601-PD/46601-PTD/46601-PTM)

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This Programme Document is subject to review and changes which the programme offering Department can decide to make from time to time. Just in case any updated information is necessary after the publication of this document, 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". Should any discrepancy between the contents of this booklet and University regulations arise, University regulations always prevail.

1. GENERAL INORMATION

1.1 Offering Department

Department of Electrical and Electronic Engineering

1.2 Final Awards

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

1.3 Period of Study and Mode of Attendance

Mode of Study	MPhil	PhD	
		For students with a Master's degree containing a significant research	For students with a Bachelor's degree
Full-time	2-Year normal study period 3-Year maximum study period	3-Year normal study period 5-Year maximum study period	4-Year normal study period * 6-Year maximum study period
Part-time	4-Year normal study period 5-Year maximum study period	6-Year normal study period 7-Year maximum study period	8-Year normal study period 9-Year maximum study period

* Dual PhD: normally (2+2), but is subject to the respective partnership agreement.

1.4 Entrance Requirements

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 an MPhil or equivalent (a research postgraduate degree with a dissertation as an award requirement) conferred by 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.

English Language Requirement Requirements

Students who do not have a degree in 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.

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

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

2.1 Background and Rationale

Electrical and electronic engineering is among the key technologies that play important roles in daily living. Various sectors, such as business, commerce, communication, education, energy, entertainment, healthcare, security and transportation, require electrical and electronic engineering for smooth operation. Hence, it is envisioned that there is a great need for professionals who possess knowledge and leadership in the areas of electrical and electronic 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 the world.

2.2 Programme Aims

The research degree programmes are designed to (i) enable the students to acquire competence in research methods and scholarship in the discipline of related engineering disciplines; and (ii) display sustained independent effort and original thought, to become capable professionals, researchers or scholars.

2.3 Relationship of Programme aims to University Missions

University Missions	Programme Aim (i)	Programme Aim (ii)
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.	√	√

2.4 Institutional Learning Outcomes

I. 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, possess 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.

II. 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 society in general.

III. 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

The programme of research is designed in such a way as to enable students to:

A	act with integrity, and in an ethical manner in conducting research and in publications;
B	demonstrate the ability to read and evaluate the solid literature in his/her research area;
C	apply and develop advanced techniques to conduct research effectively;
D	appreciate current research and developments in various areas of his/her discipline and their challenges, and be able to assimilate advanced knowledge in the electrical and electronic engineering discipline;
E	publish in international journals and present research outcomes at conferences;
F	able to formulate research objectives and analyze research problems;
G	for MPhil students: design and conduct research projects; for PhD students: design and conduct research projects independently;

H	for PhD students: deal with multi-disciplinary approaches and translate knowledge, models, algorithms, processes, and solutions from areas to his/her own;
I	for MPhil students, be competent teachers/researchers, or pursue PhD studies in their discipline; and for PhD students, be competent teachers/researchers, or industrial R&D professionals in discipline.

2.6 Relationship between Programme Outcomes and Programme Aims

Intended Programme Learning Outcomes	Programme Aims	
	enable the students to acquire competence in research methods and scholarship in the discipline of related engineering disciplines	display sustained independent effort and original thought, to become capable professionals, researchers or scholars
A	√	√
B	√	√
C	√	√
D	√	√
E	√	√
F	√	√
G	√	√ (PhD)
H	√	√ (PhD)
I		√ (PhD)

2.7 Relationship between Programme Outcomes and Institutional Learning Outcomes

Intended Programme Learning Outcomes	Institutional Learning Outcomes		
	Research and Scholarship Excellence	Originality	Lifelong Learning Capability
A	√	√	√
B	√	√	√
C	√	√	√
D	√	√	√
E	√	√	√
F	√	√	√
G	√	√ (PhD)	√
H	√	√ (PhD)	√
I		√ (PhD)	√

2.8 Relationship between the Intended Learning Outcomes of the Programme with Subjects

2.9 Doctor of Philosophy (PhD)

Programme Outcomes	HTI6081 Ethics: Research, Professional & Personal Perspectives	EIE6200 Methodology for Engineering and Scientific Research	Special Topic Subjects	Research Seminars	Practicum	International conference / workshop attendance and presentation	Journal Paper Publications	Thesis write-up and oral defense
a/ act with integrity, and in an ethical manner in conducting research and in publications	√	√				√	√	
b/ demonstrate the ability to read and evaluate the solid literature in his/her research area		√				√	√	√
c/ apply and develop advanced techniques to conduct research effectively			√				√	√
d/ appreciate current research and developments in various areas of his/her discipline and their challenges, and able to assimilate advanced knowledge in the electrical and electronic engineering discipline		√	√	√			√	√
e/ publish in international journals and present research outcomes at conferences						√	√	
f/ able to formulate research objectives and analyze research problems		√					√	√
g/ design and conduct research projects independently							√	√
h/ deal with multi-disciplinary approaches and translate knowledge, models, algorithms, processes, and solutions from areas to his/her own						√	√	√
i/ be a competent teacher/ researcher, or industrial R&D professional in his/ her discipline.					√	√	√	√

Master of Philosophy (MPhil)

Programme Outcomes	HTI6081 Ethics: Research, Professional & Personal Perspectives	EIE6200 Methodology for Engineering and Scientific Research	Special Topic Subjects	Research seminars	International conference / workshop attendance and presentation	Journal paper publications	Thesis write-up and oral defense
a/ act with integrity, and in an ethical manner in conducting research and in publications	√	√			√	√	
b/ demonstrate the ability to read and evaluate the solid literature in his/her research area		√			√	√	√
c/ apply and develop advanced techniques to conduct research effectively			√			√	√
d/ appreciate current research and developments in various areas of his/her discipline and their challenges, and able to assimilate advanced knowledge in the Electronic and Information Engineering discipline		√	√	√		√	√
e/ publish in international journals and present research outcomes at conferences					√	√	
f/ able to formulate research objectives and analyze research problems		√				√	√
g/ design and conduct research projects						√	√
h/ be a competent teacher/researcher, or pursue PhD studies in his/her discipline					√	√	√

3. PROGRAMME STRUCTURE

3.1 University Coursework Requirements

Programme	Credit Requirements	Details
MPhil (full-time and part-time)	9 credits + English Enhancement Subjects*	0/3/5-credit English Enhancement subjects* 0-credit e-Learning module on "Understanding China and the Hong Kong Special Administrative Region, P.R.C."** 1-credit HTI6081 3-credit EIE6200 2-credit Seminars 6-credit other subjects (no more than 3 credits from guided-study subjects)
PhD 3-year full-time / 6-year part-time	15 credits + English Enhancement Subjects*	0/3/5-credit English Enhancement subjects* 0-credit e-Learning module on "Understanding China and the Hong Kong Special Administrative Region, P.R.C."** 1-credit HTI6081 3-credit EIE6200 3-credit Seminars 2-credit Practicum 9-credit other subjects (no more than 6 credits from guided-study subjects)
PhD 4-year full-time / 8-year part-time	22 credits + English Enhancement Subjects*	0/3/5-credit English Enhancement subjects* 0-credit e-Learning module on "Understanding China and the Hong Kong Special Administrative Region, P.R.C."** 1-credit HTI6081 3-credit EIE6200 4-credit Seminars 2-credit Practicum 15-credit other subjects (no more than 9 credits from guided-study subjects)

* English Enhancement Subjects

All RPg Students admitted from the 2021/22 Intake Cohort onwards are required to take the RLSA in their first semester of study at PolyU to be arranged by ELC. Based on their performance of the RLSA, students will need to take relevant subjects according to the following arrangement:

RLSA Performance	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

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

** E-Learning module on "Understanding China and the Hong Kong Special Administrative Region, PRC": Starting from the 2022/23 intake cohort, all research students are required to complete the e-Learning module on "Understanding China and the Hong Kong Special Administrative Region, PRC" before thesis submission as a graduation requirement. Students are encouraged to complete the requirement as early as possible. Details on the requirement: https://www.polyu.edu.hk/ous/nationaleducation/understanding-china-and-hongkong/.

3.2 Subjects' Support of Programme Outcomes

The following subjects support the programme outcomes through teaching activities, practice and examination:

3.2.1 Subject base training

Ethics Subject

Guided-study Subjects

Guided-study subjects are those in which normally no lecturing is done and in which the RPg student is required by the subject supervisor to read specified monographs and journal publications; the RPg student has to meet the subject supervisor frequently to discuss his/her progress in the subject. Coursework normally consists of assignments and presentations. An examination is compulsory and normally includes both written and oral.

If the RPg student plans to register for this subject, he/she needs to identify an appropriate subject supervisor who is also required to submit a meeting plan with the topic, by the end of Week 3 of each semester, for the DRC Chair's approval. At the end of the semester, the RPg student is examined by the subject supervisor and another staff member who is knowledgeable about the topic. A grade will be given in the same way as for regular taught subjects in a specific form used by the Department (instead of GS/27). All guided-study subjects will be at level 6 and their code numbers will be between 6800 and 6999. The grades obtained by the RPg students on Guided-study subjects will be considered and endorsed by the relevant DRC based on the assessment reports.

Others:

Research postgraduate courses offered by PolyU / other universities

3.2.2 Non-subject base training

Research Seminars

All FT RPg students are required to attend at least 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.

All PT RPg students are required to attend at least 10 research seminars per 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.

RPg students are recommended to complete one credit per year (for FT students) or per two years (for PT 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 FT students) or per two years (for PT students) to fulfil the research seminar credit requirement.

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).

Chief Supervisors are required to assess the seminars and the report (with a pass or failure grade). RPg students failing to submit a report to the satisfaction of their Chief Supervisor are required to make a re-submission until a passing grade is obtained. The Chief Supervisor has to pass the record of the seminars attended by the RPg students and the report with a passing grade to the Department's General Office for custody at the end of each academic year.

Practicum

To earn one credit, PhD/Joint PhD students will be required to engage in teaching activities/professional service assigned by the Head of Unit (HoU) or his/her delegate for 6 hours/week in any 13-week semester. Students are allowed to complete these two credits at any time before thesis submission. They can choose to complete these two credits in two different semesters or within the same semester, subject to the approval of the Chief Supervisor.

Stipend recipients* are not allowed to fulfil part of their departmental training requirement through the completion of the Practicum credits as Practicum is credit-bearing and part of the coursework requirements.

* Training Received by Stipend Recipients

Stipend recipients are required to report the teaching and service training in annual progress reports. **Fulfilling the training requirement for not less than 100 hours per year is a condition of receiving the stipend. The stipend may be stopped if the training requirement is not fulfilled.** The Department has to (based on the suggestion of Chief Supervisors) make the decision and propose the recommendation. GS will then review all the student reports and assessments of Departments and confirm the reports.

PhD/Joint PhD students who are required to undertake teaching supporting activities are required to complete the training programmes organised by the Educational Development Centre, English Language Centre / Chinese Language Centre (as required) before the commencement of any teaching supporting activities.

The HoU or his/her delegate are required to:

- ensure that the activities are structured and can be assessed properly;
- submit to the Subject Assessment Review Panel, at the end of the session, 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.

Others:

- Attendance and presentation at international conferences or workshops;
- Journal paper publications;
- Thesis write-up and oral defense

3.3 Programme Specified Subjects and Credits

Subjects	Compulsory / Elective	MPhil	PhD	
		2-yr FT 4-yr PT	3-yr FT 6-yr PT	4-yr FT 8-yr PT
		Credits		
HTI6081 Ethics: Research, Professional & Personal Perspectives*	C	1	1	1
EIE6200 Methodology for Engineering and Scientific Research	C	3	3	3
EE6001J or EIE6201 Research Seminar	C	1	1	1
EE6001K or EIE6202 Research Seminar	C	1	1	1
EE6001L or EIE6203 Research Seminar	C	--	1	1
EE6001M or EIE6204 Research Seminar	C	--	--	1
EE6002 or EIE6205 to EIE6206 Practicum	C	--	2	2
Electives from: ➢ EIE6207 Theoretical Fundamental and Engineering Approaches for Intelligent Signal and Information Processing ➢ Guided-study subjects; ➢ Research postgraduate subjects offered by PolyU; ➢ Research postgraduate subjects offered by other universities	E	3	6	12 [No more than 9 credits from guided-study subjects]
Thesis	C	Non-credit bearing		
		9	**15**	**22**

Plus English Enhancement Subjects (please read 3.1 for details)

*RPg students who have not yet completed HTI6081 before Semester One, 2024/25 will be required to complete any one Academic Integrity and Ethics subject before thesis submission.

3.4 Credit transfer

3.4.1 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:

- 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;
- 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.

3.4.2 Transfer of credits of subjects at the postgraduate level earned from recognized previous studies

Applications for the transfer of credits from recognized previous studies will be endorsed by the DRC with justifications and approved by the HoU. Only credits gained from subjects at the 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 as 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.

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

3.4.4 Transfer of credits taken at a postgraduate level outside PolyU after admission

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 RC/48), via his/her Chief Supervisor, to the Department to initiate the transfer. The application will be endorsed by the DRC Chair and approved by the HoU.

The transfer of grades will be in accordance with the conversion 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	Fail

3.4.5 Minimum number of credits with a letter grade

An MPhil student must complete a 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. SYLLABI

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 *(Note 1)*	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 important to integrity and the well being of 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 *(Note 2)*	• 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 the society in general • Ethical use of information in thesis writing: understanding copyright, plagiarism and proper citation
Teaching/Learning Methodology *(Note 3)*	Lecture/seminar/workshop

Assessment Methods in Alignment with Intended Learning Outcomes

(Note 4)

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	100%	✓	✓	✓	✓	✓	✓
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 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.

Student Study Effort Required

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.

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)

Note 1: Intended Learning Outcomes
Intended learning outcomes should state what students should be able to do or attain upon completion of the subject. Subject outcomes are expected to contribute to the attainment of the overall programme outcomes.

Note 2: Subject Synopsis/ Indicative Syllabus
The syllabus should adequately address the intended learning outcomes. At the same time over-crowding of the syllabus should be avoided.

Note 3: Teaching/Leaning Methodology
This section should include a brief description of the teaching and learning methods to be employed to facilitate learning, and a justification of how the methods are aligned with the intended learning outcomes of the subject.

Note 4: Assessment Method
This section should include the assessment method(s) to be used and its relative weighting, and indicate which of the subject intended learning outcomes that each method purports to assess. It should also provide a brief explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes.

Subject Description From

<table>
<tr><td>Subject Code</td><td>EE6001J, EE6001K, EE6001L, EE6001M</td></tr>
<tr><td>Subject Title</td><td>Research Seminar I/II/III/IV</td></tr>
<tr><td>Credit Value</td><td>1</td></tr>
<tr><td>Level</td><td>6</td></tr>
<tr><td>Pre-requisite/co-requisite/Exclusion</td><td>EE6001J Pre-requisite: Nil
EE6001K Pre-requisite: Nil
EE6001L Pre-requisite: EE6001J or EE6001K
EE6001M Pre-requisite: EE6001J and EE6001K</td></tr>
<tr><td>Objectives</td><td>To encourage students to appreciate the latest research and development in various areas of his/her discipline.</td></tr>
<tr><td>Subject Intended Learning Outcomes</td><td>Upon completion of the subject students will be able:
1. To appreciate the latest research and development in various research areas and disciplines.
2. To meet and discuss with experts and leaders in person in various research areas and disciplines.
3. To disseminate and promote research outputs in various research areas and disciplines through discussions and report.</td></tr>
<tr><td>Subject Synopsis / Indicative Syllabus</td><td>To attend research seminars in various research areas and disciplines.</td></tr>
<tr><td>Teaching / Learning Methodology</td><td>Students are required to attend at least 10 research seminars which may or may not be organized by the Department. The duration of each seminar should not be less than an hour. Students are required to submit a report with no less than 1500 words (excluding references) on one of the attended seminars to their Chief Supervisors. The topic of the seminar reported on should not be related directly to the thesis title of the student. Assessment of the report will be given with a pass or failure grade. Students who failed to submit a report to the satisfaction of their Chief Supervisors are required to make a re-submission until a pass grade is obtained.

<table>
<tr><td>Teaching/Learning Methodology</td><td colspan="3">Intended subject learning outcomes</td></tr>
<tr><td></td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>Seminars</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Report</td><td>✓</td><td></td><td>✓</td></tr>
</table>
</td></tr>
<tr><td>Assessment Methods, its alignment of Intended Subject Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods</td><td rowspan="2">% weighting</td><td colspan="3">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>1</td><td>2</td><td>3</td></tr>
<tr><td>Attendance</td><td>50</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Report</td><td>50</td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>Total</td><td>100</td><td colspan="3"></td></tr>
</table>
</td></tr>
<tr><td>Measurements of the Intended Subject Learning Outcomes</td><td>
<table>
<tr><td>Intended Subject Learning Outcomes</td><td>Related Programme Learning Outcome</td><td>Assessment Methods</td><td>Measurement Level</td><td>Assessment Standard</td></tr>
<tr><td>1</td><td rowspan="3">e</td><td rowspan="3">Attendance and report</td><td rowspan="3">Pass</td><td rowspan="3">Not less than 70% of students in the class achieving the Measurement Level</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td></tr>
</table>
</td></tr>
</table>

Student Study Effort Expected	- Seminars	20 Hrs
	- Self-study and Preparation of report	15 Hrs
	Total student study effort	35 Hrs
Reading List and References	NA	

Subject Description From

<table>
<tr><td>Subject Code</td><td>EE6002</td></tr>
<tr><td>Subject Title</td><td>Practicum</td></tr>
<tr><td>Credit Value</td><td>2 training credits</td></tr>
<tr><td>Level</td><td>6</td></tr>
<tr><td>Pre-requisite/co-requisite/Exclusion</td><td>Nil</td></tr>
<tr><td>Objectives</td><td>To train student as a competent teacher, researcher, or industrial R& D professional in his/ her discipline.</td></tr>
<tr><td>Subject Intended Learning Outcomes</td><td>Upon completion of the subject students will be able:
1. To engage in teaching support activities.
2. To engage in departmental research support activities.</td></tr>
<tr><td>Subject Synopsis / Indicative Syllabus</td><td>To engage in teaching/research supporting activities.</td></tr>
<tr><td>Teaching / Learning Methodology</td><td>For 1 credit, students are required to engage in teaching / research supporting activities assigned by the Head of Department or his/her delegate for up to 6 hours per week in any 13-week semester. Before the commencement of any teaching supporting activities, students are required to complete the training programmes organized by the Education Development Centre. 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 English Learning Centre before taking up any teaching supporting activities.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="2">Intended subject learning outcomes</td></tr>
<tr><td>1</td><td>2</td></tr>
<tr><td>Teaching support duties</td><td>✓</td><td></td></tr>
<tr><td>Research support duties</td><td></td><td>✓</td></tr>
</table></td></tr>
<tr><td>Assessment Methods, its alignment of Intended Subject Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods</td><td rowspan="2">% weighting</td><td colspan="2">Intended subject learning outcomes to be assessed</td></tr>
<tr><td>1</td><td>2</td></tr>
<tr><td>Student feedback</td><td>50</td><td>✓</td><td>✓</td></tr>
<tr><td>Lecturer evaluation</td><td>50</td><td>✓</td><td>✓</td></tr>
<tr><td>Total</td><td>100</td><td colspan="2"></td></tr>
</table></td></tr>
<tr><td>Measurements of the Intended Subject Learning Outcomes</td><td>
<table>
<tr><td>Intended Subject Learning Outcomes</td><td>Related Programme Learning Outcome</td><td>Assessment Methods</td><td>Measurement Level</td><td>Assessment Standard</td></tr>
<tr><td>1</td><td rowspan="2">h</td><td rowspan="2">Student feedback and lecturer evaluation</td><td rowspan="2">Pass</td><td rowspan="2">Not less than 70% of students in the class achieving the Measurement Level</td></tr>
<tr><td>2</td></tr>
</table></td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>- Teaching/research support activities</td><td>156 Hrs</td></tr>
<tr><td>Total student study effort</td><td>156 Hrs</td></tr>
</table></td></tr>
<tr><td>Reading List and References</td><td>NA</td></tr>
</table>

Subject Description Form

Subject Code	EE6521
Subject Title	Industrial Power Electronics
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide power electronics engineers with in depth knowledge of the industrial power electronics. 2. To provide latest development in power supplies, industrial power electronics system and their applications in renewable energy systems. 3. To develop a skill in power electronics design including passive components, packaging and standards 4. To enable students to understand the power quality issues and the active and reactive power flow 5. To encourage students to advance in-depth research on new converter technologies to meet new requirements in the context of smart city and smart grid with high penetration of renewable energies and electric vehicles.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Acquire an in-depth understanding of power supply concept and design and be able to analyse the industrial needs for static power conversion. b. Apply the international standards to power electronics design. c. Have a global view on recent development on power electronics and facilitate applications of power electronics in various industries d. Work in teams and independently when conducting power electronics design and testing.
Subject Synopsis/ Indicative Syllabus	1. ***Industrial power systems:*** Static power systems, battery systems, AC systems, DC systems and AC-DC power conversion. 2. ***Power conversion:*** Soft-switching, power factor correction, inverter configurations and static converters. 3. ***Special environment power electronics:*** Power electronics distribution system, industrial guidelines, variable speed and constant frequency systems, actuation systems, brushless drives and other applications of power electronics in industry 4. ***Industrial power supplies:*** Converter topologies, decentralized power, power modules, electro-magnetic compatibility, international standards and reliability. 5. ***Power quality improvement:*** Fourier analysis of voltage current waveforms, total harmonic distortion, passive/active filters, rectifier, power quality issues, reactive power compensation. 6. ***Magnetics and capacitors:*** High frequency inductors and transformers, winding techniques, core loss analysis, optimization of magnetics and power capacitors.

Laboratory Experiments:

Selected topics in computer simulation, Motor drive, DC-DC and AC-DC power converters

Teaching/Learning Methodology

Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on design and practical applications are given through experiments and mini-projects, in which the students are expected to solve design problems with real-life constraints and to attain pragmatic solutions with critical and analytical thinking. Interactive laboratory sessions are introduced to encourage better preparation and hence understanding of the experiments. Experiments are designed to supplement the lecturing materials so that the students are encouraged to take extra readings and to look for relevant information.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	✓	✓	✓	
Tutorials	✓	✓		
Experiments				✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	60%	✓	✓	✓	
2. Test	20%	✓	✓	✓	
3. Laboratory performance / report	20%				✓
Total	100%				

One end-of-semester written examination; one mid-semester-test; one end-of-semester test; laboratory performance evaluation (including punctuality, initiative, and technical reasoning); and laboratory report on a particular experiment.

Student Study Effort Expected

Class contact:	
▪ Lecture/tutorial	30 Hrs.
▪ Tutorial/Student presentation	3 Hrs.
▪ Laboratory	6 Hrs.
Other student study effort:	
▪ Laboratory and presentation preparation/report	15 Hrs.
▪ Self-study	66 Hrs.
Total student study effort	120 Hrs.

Reading List and References

Reference books:

1. A. M. Trzynadlowski, Introduction to Modern Power Electronics, Third Edition, Wiley, 2015.
2. M.Cirrincione, M. Pucci, G. Vitale, Power Converters and AC Electrical Drives with Linear Neural Networks, CRC Press, 2012.
3. N. Mohan, Power Electronics: A First Course, John Wiley & Sons, 2012.
4. F.P. McCluskey, High temperature Electronics, CRC Press, 1997
5. K.W.E. Cheng, Classical Switched Mode and Resonant Power Converters, The Hong Kong Polytechnic University, 2002

Subject Description Form

Subject Code	EE6530
Subject Title	Electrical Energy-Saving Systems
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To enable students to establish a research skill on energy saving using techniques of electrical engineering. 2. To provide an in-depth knowledge on selected topics of energy-saving systems in electrical engineering. 3. To enable students to understand typical energy storage systems, its associated issues of grid connection and related technical considerations. 4. To enable students to understand the potential of solar energy and characteristics & performance of various kinds solar energy systems. 5. To enable students to understand various techniques and systems for control and monitoring of energy saving, as well as the related communication protocol and interfacing requirements. 6. To enable students to understand control gears for lighting systems and variable speed drives for HVAC systems & elevators.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Examine the operation principle & control strategy of various energy storage systems, compensation techniques, topologies of these systems and identify their benefits & impacts. b. Examine the principle and characteristics of various solar energy devices, and identify the potentials of solar energy. Calculate available solar irradiation for a given location. c. Understand the theory of energy saving and describe the operation principle and characteristics of typical control and monitoring systems for energy saving, including the communication protocols. d. Identify different energy saving control for industrial plants and multi-storey buildings, including giving examples. e. Examine the operation principle and characteristics of typical control gear for lighting and variables speed drives. f. Given a technical topic, carry out literature search and report the findings in a presentation and be able to work and communicate effectively in a team setting.
Subject Synopsis/ Indicative Syllabus	1. ***Energy storage systems*:** Local compensation, utility Load Factor, peak lopping and valley filling, energy storage systems, battery energy storage, super capacitor, power electronics topologies, control strategy, grid connection, voltage support, power quality improvement, environmental impact, improvement of utility energy efficiencies.

2. ***Solar energy utilization*:** Solar irradiation on earth, potentials of solar energy, solar thermal system systems, photovoltaic systems, characteristics and performance of typical BIPV systems and estimation of its energy output, passive solar devices on buildings and mobility for energy saving, and case study.
3. ***Energy saving control and monitoring systems*:** Theory of energy saving, concept of building energy efficiency, control and monitoring systems and some of its related communication protocols. Application examples.
4. ***Lighting, ballast, and variable speed drives*:** Magnetic ballast, electronic ballast, lighting design, fluorescent, LED and HID lamps, variable speed drives for HVAC systems and elevators, energy storage and regeneration for elevators, harmonics implications.

Laboratory Experiments, Seminars, Site Visits:
Demonstration on operating principles of some selected energy-saving systems.

Case study:
Selections of practical real life energy-saving systems in Hong Kong.

Teaching/Learning Methodology

Lectures and tutorials are the primary means of conveying the basic concepts and theories. Practical experiences on power electronics design, energy saving and applications are given through mini-projects. Mini-projects are given in the beginning of the study. Students are encouraged to form group to jointly investigate an industrial problem and they have to present the projects in front of the class.

Teaching/Learning Methodology	Outcomes					
	a	b	c	d	e	f
Lectures	√	√	√	√	√	
Tutorials	√	√	√	√	√	
Mini-project						√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed					
		a	b	c	d	e	f
1. Examination	60%	√	√	√	√	√	
2. Class Test and/or Assignment	30%	√	√	√	√	√	
3. Mini-project & Report	10%	√	√	√	√	√	√
Total	100%						

It is a fundamental energy saving subject. The outcomes on concepts, design and applications are assessed by the usual means of examination and test whilst those on analytical skills, problem-solving techniques and practical considerations of circuit design, as well as technical reporting and teamwork, are evaluated by experiments, mini-project and the reports.

Student Study Effort Expected	Class contact:	
	▪ Lecture/Tutorial	30 Hrs.
	▪ Seminar/Case study	9 Hrs.
	Other student study effort:	
	▪ Mini-project/report	15 Hrs.
	▪ Self-study	66 Hrs.
	Total student study effort	120 Hrs.

Reading List and References

Reference books:

Battery Storage Systems

1. D. Andrea, Battery Management Systems for Large Lithium Ion Battery Packs, Artech House, 2010.
2. P.W. Parfomak, Energy storage for Power Grids and Electric Transportation: A Technology Assessment, Congressional Research Service, 2012.
3. Y. Brunet, Energy storage, Wiley, 2010
4. F. S. Barnes, J.G. Levine, Large Energy Storage Systems Handbook, CRC Press, 2011

Solar Energy Utilisation

5. S. Yannas, Solar Energy and Housing Design, Architectural Association, 2005/2006
6. R. Messenger, Photovoltaic Systems Engineering, CRC Press, 2000.
7. C. Prapanavarat, Investigation of the Performance of a Photovoltaic AC Module, Generation, Transmission and Distribution, IEE Proceedings, Vol: 149, Issue 4, Jul 2002
8. Web site of Energy Efficiency and Renewable Energy from the Dept. of Energy of USA, http://www.eere.energy.gov/
9. Web site of the Key Centre of Photovoltaic Engineering in University of New South Wales, http://www.pv.unsw.edu.au/

Energy Saving Control and Monitoring Systems

10. EMSD of HKSAR Govt, Code of Practice for Energy Efficiency of Building Services Installation, 2012
11. EMSD of HKSAR Govt, Code of Practice for Building Energy Audit, 2012
12. M. Wiebe, A Guide to Utility Automation: AMR, SCADA, and IT Systems for Electric Power, c1999.
13. Bela Liptak, Instrument Engineers' Handbook, 4th Edition, Volume Two: Process Control and Optimization, CRC 2005.

Lighting, Ballast, and Variable Speed Drives

14. J.R. Benya, D.J. Leban, Lighting Retrofit and Relighting: A Guide to Energy Efficient Lighting, John Wiley & Son, 2011
15. M.H. Rashid, Power Electronics Handbook: Devices, Circuits and Applications, Academic Press, 2010
16. Guidelines on Energy Efficiency of Lift and Escalator Installations, 2000 Edition, Electrical and Mechanical Services Department (EMSD), the Government of the HKSAR, Hong Kong
17. K.W.E.Cheng, Design and Fabrication of Electronics and Optical Systems for Advanced Automotive Lighting Systems, The Hong Kong Polytechnic University, 2007

Subject Description Form

Subject Code	EE6811 – EE6813
Subject Title	Special Topics in Advanced Power System I/II/III
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	Recommended background knowledge: Knowledge of Power Systems equivalent to the final year of an Honours Degree in Electrical Engineering course. Preference will be given to those who has had research or working experience in the topic chosen.
Objectives	To provide practising electrical engineers with an opportunity to study in depth a topic in advanced power system engineering and management which are important to engineers and researchers.
Intended Learning Outcomes	Upon completion of the subject students will be able: 1. To acquire an understanding of a selected topic in this area, up to the expertise knowledge level, through self study and guidance by the supervisor. 2. To possess the ability of developing latest innovations and cutting edge technologies, through literature studies, simulation studies, and/or experimental studies. 3. To be able to report and explain the above selected area of knowledge, through written and oral means.
Subject Synopsis/ Indicative Syllabus	To conduct an in-depth study in a particular topic in Advanced Power System. The topic content will be fixed after mutual discussion with the prospective supervisor prior to the start of the module.
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 once per week to discuss the progress made by the student in the subject. Courseworks 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.

	<table><tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="3">Intended subject learning outcomes</td></tr><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>Lecture & Tutorial (for mode I study only)</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>One-to-one guided tutorial</td><td>✓</td><td></td><td>✓</td></tr><tr><td>Self study</td><td>✓</td><td>✓</td><td></td></tr><tr><td>Software/hardware experimentation</td><td></td><td>✓</td><td>✓</td></tr></table>
Assessment Methods in Alignment with Intended Learning Outcomes	<table><tr><td rowspan="2">Specific assessment methods</td><td rowspan="2">% weighting</td><td colspan="3">Intended subject learning outcomes to be assessed</td></tr><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>Coursework</td><td>49</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Examination</td><td>51</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Total</td><td>100</td><td colspan="3"></td></tr></table> NB: Examination (normally both written and oral, conducted by the responsible staff and a staff member who is knowledgeable in the topic) Coursework (normally assignment and presentations)
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	To be assigned by the subject lecturer.

Subject Description Form

Subject Code	EE6821 – EE6823
Subject Title	Special Topics in Advanced Utilisation I/II/III
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	Recommended background knowledge: Knowledge of Power Electronics and Drives equivalent to the final year of an Honours Degree in Electrical Engineering course. Preference will be given to those who has had research or working experience in the topic chosen.
Objectives	To provide practising electrical engineers with an opportunity to study in depth a topic in advanced utilisation engineering and management which are important to engineers and researchers.
Intended Learning Outcomes	Upon completion of the subject students will be able: 1. To acquire an understanding of a selected topic in this area, up to the expertise knowledge level, through self study and guidance by the supervisor. 2. To possess the ability of developing latest innovations and cutting edge technologies, through literature studies, simulation studies, and/or experimental studies. 3. To be able to report and explain the above selected area of knowledge, through written and oral means.
Subject Synopsis/ Indicative Syllabus	To conduct an in-depth study in a particular topic in Advanced Utilisation. The topic content will be fixed after mutual discussion with the prospective supervisor prior to the start of the module.
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 once per week to discuss the progress made by the student in the subject. Courseworks 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.

	<table><tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="3">Intended subject learning outcomes</td></tr><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>Lecture & Tutorial (for mode I study only)</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>One-to-one guided tutorial</td><td>✓</td><td></td><td>✓</td></tr><tr><td>Self study</td><td>✓</td><td>✓</td><td></td></tr><tr><td>Software/hardware experimentation</td><td></td><td>✓</td><td>✓</td></tr></table>
Assessment Methods in Alignment with Intended Learning Outcomes	<table><tr><td rowspan="2">Specific assessment methods</td><td rowspan="2">% weighting</td><td colspan="3">Intended subject learning outcomes to be assessed</td></tr><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>Coursework</td><td>49</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Examination</td><td>51</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Total</td><td>100</td><td colspan="3"></td></tr></table> NB: Examination (normally both written and oral, conducted by the responsible staff and a staff member who is knowledgeable in the topic) Coursework (normally assignment and presentations)
Student Study Effort Expected **(Mode I)**	<table><tr><td>Class contact (time-tabled):</td><td></td></tr><tr><td>▪ Lecture</td><td>24 Hrs.</td></tr><tr><td>▪ Tutorial/Laboratory/Practical Classes</td><td>15 Hrs.</td></tr><tr><td>Guided activities:</td><td></td></tr><tr><td>▪ Meeting with the supervisor / Presentations/ Viva examination</td><td>10 Hrs.</td></tr><tr><td>▪ Self-study / Preparation of reports and presentation materials</td><td>56 Hrs.</td></tr><tr><td>Total student study effort</td><td>105 Hrs.</td></tr></table>
(Mode II)	<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>
Reading List and References	To be assigned by the subject lecturer.

Subject Description Form

Subject Code	EE6831 – EE6833
Subject Title	Special Topics in Advanced Control System I/II/III
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	Recommended background knowledge: Knowledge of Control Systems equivalent to the final year of an Honours Degree in Electrical Engineering course. Preference will be given to those who has had research or working experience in the topic chosen.
Objectives	To provide practising electrical engineers with an opportunity to study in depth a topic in advanced control system engineering and management which are important to engineers and researchers.
Intended Learning Outcomes	Upon completion of the subject students will be able: 1. To acquire an understanding of a selected topic in this area, up to the expertise knowledge level, through self study and guidance by the supervisor. 2. To possess the ability of developing latest innovations and cutting edge technologies, through literature studies, simulation studies, and/or experimental studies. 3. To be able to report and explain the above selected area of knowledge, through written and oral means.
Subject Synopsis/ Indicative Syllabus	To conduct an in-depth study in a particular topic in Advanced Control System. The topic content will be fixed after mutual discussion with the prospective supervisor prior to the start of the module.
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 once per week to discuss the progress made by the student in the subject. Courseworks 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.

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Assessment Methods in Alignment with Intended Learning Outcomes	<table><tr><td rowspan="2">Specific assessment methods</td><td rowspan="2">% weighting</td><td colspan="3">Intended subject learning outcomes to be assessed</td></tr><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>Coursework</td><td>49</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Examination</td><td>51</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Total</td><td>100</td><td colspan="3"></td></tr></table> NB: Examination (normally both written and oral, conducted by the responsible staff and a staff member who is knowledgeable in the topic) Coursework (normally assignment and presentations)
Student Study Effort Expected **(Mode I)**	<table><tr><td>Class contact (time-tabled):</td><td></td></tr><tr><td>▪ Lecture</td><td>24 Hrs.</td></tr><tr><td>▪ Tutorial/Laboratory/Practical Classes</td><td>15 Hrs.</td></tr><tr><td>Guided activities:</td><td></td></tr><tr><td>▪ Meeting with the supervisor / Presentations/ Viva examination</td><td>10 Hrs.</td></tr><tr><td>▪ Self-study / Preparation of reports and presentation materials</td><td>56 Hrs.</td></tr><tr><td>Total student study effort</td><td>105 Hrs.</td></tr></table>
(Mode II)	<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>
Reading List and References	To be assigned by the subject lecturer.

Subject Description Form

Subject Code	EE6841 – EE6843
Subject Title	Special Topics in Advanced Fiber Optic I/II/III
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	Recommended background knowledge: Knowledge of Fiber Optic equivalent to the final year of an Honours Degree in Electrical Engineering course. Preference will be given to those who has had research or working experience in the topic chosen.
Objectives	To provide practising electrical engineers with an opportunity to study in depth a topic in advanced fiber optic engineering and management which are important to engineers and managers.
Intended Learning Outcomes	Upon completion of the subject students will be able: 1. To acquire an understanding of a selected topic in this area, up to the expertise knowledge level, through self study and guidance by the supervisor. 2. To possess the ability of developing latest innovations and cutting edge technologies, through literature studies, simulation studies, and/or experimental studies. 3. To be able to report and explain the above selected area of knowledge, through written and oral means.
Subject Synopsis/ Indicative Syllabus	To conduct an in-depth study in a particular topic in Advanced Fiber Optic. The topic content will be fixed after mutual discussion with the prospective supervisor prior to the start of the module.
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 once per week to discuss the progress made by the student in the subject. Courseworks 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.

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Assessment Methods in Alignment with Intended Learning Outcomes	<table><tr><td rowspan="2">Specific assessment methods</td><td rowspan="2">% weighting</td><td colspan="3">Intended subject learning outcomes to be assessed</td></tr><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>Coursework</td><td>49</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Examination</td><td>51</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Total</td><td>100</td><td colspan="3"></td></tr></table> NB: Examination (normally both written and oral, conducted by the responsible staff and a staff member who is knowledgeable in the topic) Coursework (normally assignment and presentations)
Student Study Effort Expected **(Mode I)**	<table><tr><td>Class contact (time-tabled):</td><td></td></tr><tr><td>▪ Lecture</td><td>24 Hrs.</td></tr><tr><td>▪ Tutorial/Laboratory/Practical Classes</td><td>15 Hrs.</td></tr><tr><td>Guided activities:</td><td></td></tr><tr><td>▪ Meeting with the supervisor / Presentations/ Viva examination</td><td>10 Hrs.</td></tr><tr><td>▪ Self-study / Preparation of reports and presentation materials</td><td>56 Hrs.</td></tr><tr><td>Total student study effort</td><td>105 Hrs.</td></tr></table>
(Mode II)	<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>
Reading List and References	To be assigned by the subject lecturer.

Subject Description Form

Subject Code	EE6851 – EE6853
Subject Title	Special Topics in Smart Materials and Structures I/II/III
Credit Value	3
Level	6
Pre-requisite / Co-requisite/ Exclusion	Recommended background knowledge: Knowledge of Electrical Engineering equivalent to the final year of an Honours Degree in Electrical Engineering course. Preference will be given to those who have had research or working experience in the topic chosen.
Objectives	To provide practising engineers with an opportunity to study in depth a topic in smart materials and structures which are becoming increasingly important to engineers and researchers.
Intended Learning Outcomes	Upon completion of the subject students will be able: 4. To acquire an understanding of a selected topic in this area, up to the expertise knowledge level, through self study and guidance by the supervisor. 5. To possess the ability of developing latest innovations and cutting edge technologies, through literature studies, simulation studies, and/or experimental studies. 6. To be able to report and explain the above selected area of knowledge, through written and oral means.
Subject Synopsis/ Indicative Syllabus	To conduct an in-depth study in a particular topic in Smart Materials and Structures. The topic content will be fixed after mutual discussion with the prospective supervisor prior to the start of the module.
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 once per week to discuss the progress made by the student in the subject. Courseworks 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.

	<table><tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="3">Intended subject learning outcomes</td></tr><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>Lecture & Tutorial (for mode I study only)</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>One-to-one guided tutorial</td><td>✓</td><td></td><td>✓</td></tr><tr><td>Self study</td><td>✓</td><td>✓</td><td></td></tr><tr><td>Software/hardware experimentation</td><td></td><td>✓</td><td>✓</td></tr></table>
Assessment Methods in Alignment with Intended Learning Outcomes	<table><tr><td rowspan="2">Specific assessment methods</td><td rowspan="2">% weighting</td><td colspan="3">Intended subject learning outcomes to be assessed</td></tr><tr><td>1</td><td>2</td><td>3</td></tr><tr><td>Coursework</td><td>49</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Examination</td><td>51</td><td>✓</td><td>✓</td><td>✓</td></tr><tr><td>Total</td><td>100</td><td colspan="3"></td></tr></table> NB: Examination (normally both written and oral, conducted by the responsible staff and a staff member who is knowledgeable in the topic) Coursework (normally assignment and presentations)
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	To be assigned by the subject lecturer.

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>