The Hong Kong Polytechnic University
Department of Electronic and Information Engineering

**<u>Minor Changes to the BEng (Hons) in Electronic and Information Engineering
(42470/42470-SY) (BEng in EIE) Programme Curriculum</u>**

Background

The Department reviews the programme regularly to ensure the subjects of the curriculum match with the education background, needs and abilities of the students, align with the programme aims, objectives and intended learning outcomes, as well as cater to the demand for talents from the industries. In a recent review of the BEng (Hons) in Electronic and Information Engineering (BEng in EIE) (42470) programme curriculum, the Department considered that a number of minor changes could be introduced to the programme curriculum to serve the interests and abilities of BEng in EIE students better, and to modernize the programme curriculum with some of the latest technologies of the discipline.

1. **Moving a compulsory subject EIE3123 Dynamic Electronic Systems from Semester 1 to Semester 2 in Year 3 of the normal 4-year curriculum and Year 1 of the senior-year curriculum**

During a recent review of the BEng in EIE curriculum, the Programme Executive Group (PEG) of BEng in EIE revisited and discussed the study pattern of Year 3 of the normal 4-year curriculum and Year 1 of the senior-year curriculum of the programme in its meeting on 11 March 2022. When deciding the revised study pattern, the PEG had considered the following items:

   a) the topics covered in all subjects offered in Year 3 of the normal 4-year curriculum and Year 1 of the senior-year curriculum,
   b) the knowledge students should acquire and apply to the project of EIE3105 Integrated Project, which would also be offered in Year 3 of the normal 4-year curriculum and Year 1 of the senior-year curriculum, and
   c) the failure rate of the subjects in Semester One of 2021/22.

In view of the high failure rate of EIE3100 Analogue Circuit Fundamentals, the PEG suggested to move EIE3123 Dynamic Electronic Systems to Semester 2 in order to reduce the study load of students in Semester 1, hoping that the proposed change will enable them to concentrate their effort on EIE3100 and achieve a more satisfactory performance. This compulsory subject was once planned to be offered in Semester 1. It was designed to equip students with the relevant knowledge such as modelling of dynamic systems, transient response, stability, steady-state errors, design via locus techniques, design via frequency response techniques, tuning PID controllers and digital control systems, before doing the Integrated Project (EIE3105). The subject lecturer of EIE3105 evaluated that no impact would be caused if EIE3123 was offered in Semester 2.

The updated specified progression patterns of the BEng in EIE (42470) programme after incorporating the above changes can be found in <u>Appendix I</u>.

Such changes will be <mark>**applicable to students studying the normal 4-year BEng in EIE curriculum from 2020/21 intake and onwards, and students studying the senior year BEng in EIE curriculum from 2022/23 intake and onwards**</mark>.

2. Removing an elective subject, "EIE4112 Avionics Systems", from the 4-year and Senior Year Curricula

The Department is of the view that "EIE4112 Avionics System", an elective subject of the 4-year curriculum, is no longer needed for the programme. This subject was initially introduced in 2017 for serving students of the Department of Aeronautical and Aviation Engineering (AAE) (former Interdisciplinary Division of Aeronautical and Aviation Engineering), which was newly developed under the Faculty of Engineering (FENG) at that moment. To support its development, the Department offered the subject EIE4112 to students in the sister Division and students in BEng in EIE as an elective at the same time. With the gradual development of the Division, the subject was re-coded and taught by AAE staff members. The Department also stopped offering this subject to AAE students. Considering the contents of EIE4112 are not much relevant to the programmme discipline, the Department proposed to remove this elective from the 4-year and Senior Year curricula.

3. Adding an elective subject "EIE4428 Multimedia Communications" to the 4-year and Senior Year Curricula

The Department proposed to add an elective "EIE4428 Multimedia Communications" to the 4-year and Senior Year Curricula with the following aims:

a) to provide one more technical elective for students in the programme, particularly those were articulated from HD in EIE (42375) and were allowed to exempt some subjects at the time of admission, to choose; and
b) to improve the enrollment no. of the subject and avoid class cancellation due to under-enrolment.

This subject aims to equip students to understand the current state-of-the-art developments in Internet technologies for multimedia communications; appreciate the principles used in designing multimedia protocols, and so understand why standard protocols are designed the way that they are; understand the system design principles of multimedia communications systems, and solve problems and design simple networked multimedia systems. The syllabus of EIE4428 can be found in Appendix II.

The updated specified progression patterns of the BEng in EIE (42470) programme after incorporating the above changes in proposals 2 & 3 can be found in Appendix III.

Such change will be **applicable to all students studying the normal 4-year BEng in EIE curriculum and the senior year BEng in EIE curriculum**.

March 2022

Suggested Revised Study Pattern of BEng in Electronic and Information Engineering (42470) (Normal 4-year curriculum)

Year 1	
Semester 1 (12 credits)	**Semester 2 (18 credits)**
EIE2901/IC2114 Industrial Centre Training I for EIE (5 training credits)	
AMA1110 Basic Mathematics I – Calculus and Probability & Statistics (3 credits)	AMA1120 Basic Mathematics II –Calculus and Linear algebra (3 credits)
AP10005 Physics I (3 credits)	AP10006 Physics II (3 credits)
ENG1003 Freshman Seminar for Engineering (3 credits)	CAR I (3 credits) Note 1
LCR I – English (3 credits)	ENG2003 Information Technology (3 credits)
	LCR II – English (3 credits)
	Leadership and Intra-Personal Development (3 credits)
Healthy Lifestyle (0 credit) Note 1	
Year 2	
Semester 1 (18 credits)	**Semester 2 (15 credits)**
EIE2901/IC2114 Industrial Centre Training I for EIE (continued)	
AMA2111 Mathematics I (3 credits)	AF3625 Engineering Economics (3 credits)
CAR II (3 credits) Note 1	CAR III (3 credits) Note 1
EIE2100 Basic Circuit Analysis (3 credits)	EIE2102 Basic Electronics (3 credits)
ENG2002 Computer Programming (3 credits)	EIE2211 Logic Design (3 credits)
LCR III – Chinese (3 credits)	AMA2104 Probability and Engineering Statistics (3 credits)
Choose one subject in either "Engineering Materials", "Biology" or "Chemistry" (3 credits)	
Year 3	
Semester 1 (15 credits)	**Semester 2 (18 credits)**
EIE3105 Integrated Project (6 credits)	
EIE3901/IC382 Multidisciplinary Manufacturing Project (3 training credits)	
EIE3312 Linear Systems (3 credits)	EIE3123 Dynamic Electronic Systems (3 credits)
EIE3100 Analogue Circuit Fundamentals (3 credits)	EIE3331 Communication Fundamentals (3 credits)
EIE3311 Computer System Fundamentals (3 credits)	Service-Learning (3 credits) Note 1
~~EIE3123 Dynamic Electronic Systems (3 credits)~~	Technical Elective 1 (3 credits) Note 2
EIE3333 Data and Computer Communications (3 credits)	Technical Elective 2 (3 credits) Note 2
Year 4	
Semester 1 (15 credits)	**Semester 2 (13 credits)**
EIE4433 Honours Project (6 credits)	
CAR IV (3 credits) Note 1	CLC3241P Professional Communication in Chinese (2 credits)
ENG3003 Engineering Management (3 credits)	ELC3531 Professional Communication in English for Engineering Students (2 credits)
Technical Elective 3 (3 credits) Note 2	ENG3004 Society and the Engineer (3 credits)
Technical Elective 4 (3 credits) Note 2	Technical Elective 5 (3 credits) Note 2

Total Number of Credits: 124

Note 1: The study pattern for the subjects is indicative only. Students may take these subjects according to their own schedule. They are recommended to consult their Academic Advisor for guidance and planning if necessary.

Note 2: At least 3 technical electives must be at level 4 or above.

**Suggested Revised Study Pattern of BEng in Electronic and Information Engineering (42470-SY)
(Senior-year curriculum)**

Year 1	
Semester 1 (15 credits)	**Semester 2 (18 credits)**
EIE3105 Integrated Project (6 credits)	
EIE3312 Linear Systems (3 credits)	AMA2104 Probability and Engineering Statistics (3 credits)
EIE3100 Analogue Circuit Fundamentals (3 credits)	EIE3123 Dynamic Electronic Systems (3 credits)
EIE3311 Computer System Fundamentals (3 credits)	EIE3331 Communication Fundamentals (3 credits)
~~EIE3123 Dynamic Electronic Systems (3 credits)~~	ENG3004 Society and the Engineer (3 credits)
EIE3333 Data and Computer Communications (3 credits)	Technical Elective 1 (3 credits) [Note 2]
EIE2901/IC2114 Industrial Centre Training I for EIE (5 training credits)	EIE2901/IC2114 Industrial Centre Training I for EIE (continued)
Year 2	
Semester 1 (18 credits)	**Semester 2 (16 credits)**
EIE4433 Honours Project (6 credits)	
AF3625 Engineering Economics (3 credits)	CAR II (3 credits) [Note 1,4]
Service-Learning (3 credits)	CLC3241P Professional Communication in Chinese (2 credits)
ENG3003 Engineering Management (3 credits)	CAR I (3 credits) [Note 1, 4]
Technical Elective 2 (3 credits) [Note 2]	ELC3531 Professional Communication in English for Engineering Students (2 credits)
Technical Elective 3 (3 credits) [Note 2]	Technical Elective 4 (3 credits) [Note 2]
EIE3901/IC382 Multidisciplinary Manufacturing Project (3 training credits)	EIE3901/IC382 Multidisciplinary Manufacturing Project (continued)

Total Number of Credits: 67[Note 5]

Note 1:   The study pattern for the subjects is indicative only. Students may take these subjects according to their own schedule. They are recommended to consult their Academic Advisor for guidance and planning if necessary.

Note 2:   At least 2 technical electives must be at level 4 or above.

Note 3:   This is an <u>example</u> only, which shows a possible study pattern for graduates with relevant Higher Diploma/Associate Degree from a recognized institution. The exact study pattern for senior year intakes varies from student to student depending on the approved subjects transferred.

Note 4:   6 credits of Cluster Areas Requirement (CAR) from two different cluster areas. Students also need to fulfil the English and Chinese reading and writing requirements and take 3 of the 6 CAR credits designated as "China-related" (China Studies Requirement), if such requirements have not been fulfilled in previous studies.

Note 5:   The credits required and progression pattern presented above are for students who have been given credit transfer of the 9 credits Undergraduate Degree LCR subjects based upon their previous studies. Students not meeting the equivalent standard of the Undergraduate Degree LCR will be required to take the required subjects. Details on the Undergraduate Degree LCR subjects are given in section 4.2 of this booklet.

Subject Description Form

Subject Code	EIE4428
Subject Title	Multimedia Communications
Credit Value	3
Level	4
Pre-requisite	EIE3333 Data and Computer Communications
Co-requisite/ Exclusion	Nil
Objectives	To study the technical issues and system solutions for providing multimedia communications on the Internet.
Intended Subject Learning Outcomes	**Upon completion of the subject, students will be able to:** Category A: Professional/academic knowledge and skills 1. Understand the current state-of-the-art developments in Internet technologies for multimedia communications. 2. Appreciate the principles used in designing multimedia protocols, and so understand why standard protocols are designed the way that they are. 3. Understand the system design principles of multimedia communications systems. 4. Solve problems and design simple networked multimedia systems. Category B: Attributes for all-roundedness 5. Think critically and learn independently.
Contribution of the Subject to the Attainment of the Programme Outcomes	**Programme Outcomes:** Category A: Professional/academic knowledge and skills • Programme Outcome 1, 2: This subject contributes to the programme outcome through the teaching of the knowledge of multimedia communications and through providing the students with an opportunity to apply their knowledge in ICT areas. • Programme Outcome 3: This subject contributes to the programme outcome by providing the opportunity for students to solve practical engineering problems pertaining to the field of multimedia communications. Category B: Attributes for all-roundedness • Programme Outcome 10: This subject contributes to the programme outcome by providing students with the foundations for life-long learning and continual professional development in the areas of multimedia communications.
Subject Synopsis/ Indicative Syllabus	**Syllabus:** 1. Terminal/Codec Support for Multimedia Communications Scalable Coding: SNR Scalability, Spatial Scalability, Temporal Scalability and Fine Granularity Scalability (FGS) Error Control: Error Propagation, Error Resilience Coding Techniques Rate Control: Concepts for Rate Control, MPEG TM5 Rate Control Algorithms 2. Transport Layer Support for Multimedia Communications TCP congestion control, TCP Delay Analysis, TCP Throughput Analysis, Bandwidth Allocation. Media transport protocols: Real Time Protocol (RTP) and Real Time Control Protocol (RTCP); Signalling Protocols: Real-Time Streaming Protocol (RTSP)

	3. <u>Quality of Services (QoS)</u> Integrated services (intserv): Architecture and Service Model, Resource Reservation Protocol (RSVP), Packet Scheduling Disciplines in the Internet Differentiated Services (diffserv): Framework and Concept, Assured and Expedited Services, Packet Classification, Routers Internals and Packet Dropping Techniques 4. <u>Multimedia Streaming Systems</u> Streaming architecture: Real-time Streaming and On-demand Streaming, Content Delivery Network (CDN), Data Sharing Techniques, Support of Interactive Operations, Peer-to-Peer (P2P) video streaming techniques, Case Studies on Video on Demand and IPTV **Laboratory Experiments/Mini-projects:** 1. Multimedia networking 2. Multimedia streaming

Teaching/ Learning Methodology

Teaching and Learning Method	Intended Subject Learning Outcome	Remarks
Lectures	1, 2, 3	fundamental principles and key concepts of the subject are delivered to students
Tutorials	1, 2, 3, 4, 5	supplementary to lectures and are conducted with smaller class size; students will be able to clarify concepts and to have a deeper understanding of the lecture material; problems and application examples are given and discussed
Laboratory sessions/Mini-projects	4, 5	students will make use of network simulators to simulate various types of communication networks and evaluate their performance, or students will develop a simple multimedia streaming system by integrating different components together using some existing tools.

Assessment Methods in Alignment with Intended Subject Learning Outcomes

Specific Assessment Methods/Tasks	% Weighting	Intended Subject Learning Outcomes to be Assessed (Please tick as appropriate)				
		1	2	3	4	5
1. Continuous Assessment (total 50%)						
• Assignments	8%	✓	✓	✓		✓
• Mid-Term Test	13%	✓	✓	✓	✓	✓
• End-of-Term Test	13%	✓	✓	✓	✓	✓
• Mini-Project	16%				✓	✓
2. Examination	50%	✓	✓	✓	✓	✓
Total	100%					

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

Specific Assessment Methods/Tasks	Remark
Assignments, tests and examination	end-of chapter type problems used to evaluate students' ability in applying concepts and skills learnt in the classroom; students need to think critically and creatively in order to come with an alternate solution for an existing problem
Laboratory sessions / mini-projects	each group of students are required to produce a written report; accuracy and the presentation of the report will be assessed.

Student Study Effort Expected	Class contact (time-tabled):	
	• Lecture	24 Hours
	• Tutorial/Laboratory/Practice Classes	15 Hours
	Other student study effort:	
	• Lecture: preview/review of notes; homework/assignment; preparation for test/quizzes/examination	36 Hours
	• Tutorial/Laboratory/Practice Classes: preview of materials, revision and/or reports writing	30 Hours
	Total student study effort:	**105 Hours**
Reading List and References	**Reference Books:** 1. J.K. Kurose, *Computer Networking: A Top-down Approach Featuring the Internet*, 6th ed., Pearson, 2012. 2. Ze-Nian Li and Mark S. Drew and J. Liu, *Fundamentals of Multimedia*, Springer, 2nd Edition, 2014. 3. K.R. Rao, Z.S. Bojkovic and D.A. Milovanovic, *Multimedia Communication Systems: Techniques, Standards, and Networks,* Prentice-Hall PTR, 2002.	
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Prepared by	Dr K.T. Lo	

Proposed Programme Specified Subjects for BEng in EIE Programme

Subject Code	Subject Title	CR	Category of Subjects	
			Normal Year 1 Intake	Senior Year Intake
General University Requirements (GUR)				
-	Cluster-Area Requirement I (CAR I)	3	COM	COM
-	Cluster-Area Requirement II (CAR II)	3	COM	COM
-	Cluster-Area Requirement III (CAR III)	3	COM	-
-	Cluster-Area Requirement IV (CAR IV)	3	COM	-
-	Language and Communication Requirement I (LCR I) – English *	3	COM	-
-	Language and Communication Requirement II (LCR II) – English *	3	COM	-
-	Language and Communication Requirement III (LCR III) – Chinese *	3	COM	-
-	Leadership and Intra-Personal Development	3	COM	-
-	Service-Learning	3	COM	COM
ENG1003	Freshman Seminar for Engineering	3	COM	-
-	Healthy Lifestyle	0	COM	-
Discipline-Specific Requirement (DSR)				
AF3625	Engineering Economics	3	COM	COM
AMA1110	Basic Mathematics I – Calculus and Probability & Statistics	3	COM	-
AMA1120	Basic Mathematics II –Calculus and Linear algebra	3	COM	-
AMA2104	Probability and Engineering Statistics	3	COM	COM
AMA2111	Mathematics I	3	COM	-
AP10001	Introduction to Physics	3	COM[1]	-
AP10005	Physics I	3	COM	-
AP10006	Physics II	3	COM	-
CLC3241P	Professional Communication in Chinese	2	COM	COM
EIE2100	Basic Circuit Analysis	3	COM[3]	-
EE2002A/B	Circuit Analysis	3		
EIE2102	Basic Electronics	3	COM[4]	-
EE2003A/B	Electronics	3		
EIE2211	Logic Design	3	COM	-
EIE3100	Analogue Circuit Fundamentals	3	COM	COM
EIE3105	Integrated Project	6	COM	COM
EIE3109	Mobile Systems and Application Development	3	ELE	ELE
EIE3112	Database System	3	ELE	ELE
EIE3123	Dynamic Electronic Systems	3	COM	COM
EIE3305	Integrated Analogue and Digital Circuits	3	ELE	ELE
EIE3311	Computer System Fundamentals	3	COM	COM
EIE3312	Linear Systems	3	COM	COM
EIE3320	Object-Oriented Design and Programming	3	ELE	ELE
EIE3331	Communication Fundamentals	3	COM	COM
EIE3333	Data and Computer Communications	3	COM	COM
EIE4100	Computer Vision and Pattern Recognition	3	ELE	ELE
EIE4102	IP Networks	3	ELE	ELE

Subject Code	Subject Title	CR	Category of Subjects	
			Normal Year 1 Intake	**Senior Year Intake**
EIE4104	Mobile Networking	3	ELE	ELE
EIE4105	Multimodal Human Computer Interaction Technology	3	ELE	ELE
EIE4106	Network Management and Security	3	ELE	ELE
EIE4108	Distributed Systems and Cloud Computing	3	ELE	ELE
EIE4110	Introduction to VLSI and Computer-Aided Circuit Design	3	ELE	ELE
~~EIE4112~~	~~Avionics Systems~~	~~3~~	~~ELE~~	~~ELE~~
EIE4113	Wireless and Mobile Systems	3	ELE	ELE
EIE4114	Digital Forensics for Crime Investigation	3	ELE	ELE
EIE4116	Surveillance Studies and Technologies	3	ELE	ELE
EIE4118	Intrusion Detection and Penetration Test	3	ELE	ELE
EIE4119	Mobile Device System Architecture	3	ELE	ELE
EIE4122	Deep Learning and Deep Neural Networks	3	ELE	ELE
EIE4402	Power Electronics	3	ELE	ELE
EIE4413	Digital Signal Processing	3	ELE	ELE
EIE4428	Multimedia Communications	3	ELE	ELE
EIE4432	Web Systems and Technologies	3	ELE	ELE
EIE4433	Honours Project	6	COM	COM
EIE4435	Image and Audio Processing	3	ELE	ELE
EIE4449	Optical Communication Systems and Networks	3	ELE	ELE
ELC3531	Professional Communication in English	2	COM	COM
ENG2001	Fundamentals of Materials Science and Engineering	3	COM[2] (Select any 1 subject out of these 6 subjects)	-
ABCT1101	Introductory Life Science	3		
ABCT1301	Chemistry and Modern Living	3		
ABCT1314	Chemistry and Sustainable Development	3		
ABCT1303	Biotechnology and Human Health	3		
BME11101	Bionic Human and the Future of Being Human	3		
ENG2002	Computer Programming	3	COM	-
ENG2003	Information Technology	3	COM	-
ENG3003	Engineering Management	3	COM	COM
ENG3004	Society and The Engineer	3	COM	COM
ENG4001	Project Management	3	ELE	ELE
EIE2901/IC2114	Industrial Centre Training I for EIE	5	TRN	TRN
EIE3901/IC382	Multidisciplinary Manufacturing Project	3	TRN	TRN

Note:
AF	School of Accounting and Finance
ABCT	Department of Applied Biology and Chemical Technology
AMA	Department of Applied Mathematics
AP	Department of Applied Physics
BME	Interdisciplinary Division of Biomedical Engineering
CLC	Chinese Language Centre
COM	Compulsory
EIE	Department of Electronic and Information Engineering
ELC	English Language Centre
ELE	Elective
ENG	Faculty of Engineering
IC	Industrial Centre

TRN	Training

*   Details of the Language and Communication Requirement (LCR) are set out in Section 4.2.

(1)   For HKDSE students <u>who do not have</u> Level 2 or above in HKDSE Physics or Combined Science with Physics, and non-local students from the Chinese Mainland <u>who do not have</u> a Pass (a pass is taken as 60% of the total marks of the subject) in the <u>Physics or Integrated Science subject</u> in the Joint Entrance Examination for Universities only.

(2)   Students should choose 1 subject in either "Engineering Materials", "Biology" or "Chemistry":
Engineering Materials: ENG2001 Fundamentals of Materials Science and Engineering
Biology:　　　　ABCT1101 Introductory Life Science
　　　　　　　　ABCT1303 Biotechnology and Human Health
　　　　　　　　BME11101 Bionic Human and the Future of Being Human
Chemistry:　　　ABCT1301 Chemistry and Modern Living
　　　　　　　　ABCT1314 Chemistry and Sustainable Development

Students choosing any one of the five subjects in the "Biology" and "Chemistry" areas will have the subject double-counted towards the fulfilment of both the Discipline-Specific Requirement (DSR) and CAR-D (Science, Technology and Environment). They are required to <u>choose any 3-credit subject (from level 1 to level 4)</u> to make up for the total credit requirement.

(3)   Students will take EIE2100 Basic Circuit Analysis by default but they will be allowed to choose EE2002A/B Circuit Analysis in case they cannot take EIE2100 due to reasons such as time-table clash, need to retake immediately in succeeding semester after failure, etc.

(4)   Students will take EIE2102 Basic Electronics by default but they will be allowed to choose EE2003A/B Electronics in case they cannot take EIE2102 due to reasons such as time-table clash, need to retake immediately in succeeding semester after failure, etc.