Mathematics and Information Engineering
Applicable to students admitted in 2021-22

Major Programme Requirement

A student may select either the Faculty Package of the Faculty of Engineering or of the Faculty of Science.

Students are required to complete a minimum of 84 units of courses as follows:

For students who select the Faculty Package of the Faculty of Engineering

		Units
1.	Engineering Faculty Package: ENGG1110/ESTR1002, ENGG1120/ESTR1005, ENGG1130/ESTR1006	9
2.	Foundation Courses:	9
(a)	MATH1510[a]	
(b)	IERG2060/ESTR2304	
(c)	One of the following courses: AIST1110, CHEM1280, 1380, CSCI1120/ESTR1100, CSCI1130/ESTR1102, ELEG2700, ENGG1310/ESTR1003[b], FTEC2101/ESTR2520, IERG1080, LSCI1001, 1003, MAEG1020, PHYS1003[b], 1110[b], SEEM2440/ESTR2500, SEEM2460/ESTR2540	
3.	Required Courses:	46
(a)	CSCI2100/ESTR2102, CSCI3160/ESTR3104, IERG1810, IERG2080/ESTR2306, IERG2310/ESTR2300, IERG2602, IERG3080/ESTR3308, IERG3310/ESTR3310, IERG3800, 3820, MATH1050/1058, 2020/2028, 2040/2048, 2050/2058, 2070/2078, 2230, MIEG2051/ESTR2360, MIEG2440/ESTR2362	
(b)	Research Component Courses[c]: IERG4998 and 4999	6
4.	Elective Courses: 14 units of elective courses, with at most 3 units to be counted from 4(b):	14
(a)	CSCI2110 (or MATH3250), CSCI3130, CSCI3150/ESTR3102, CSCI3230/ESTR3108, CSCI3320, 5320 (or MATH3260), ENGG1820, ENGG5501, IERG3010/ESTR3300, IERG3050, 3060, IERG3280/ESTR3302, IERG3300/ESTR3304 (or MATH4240), IERG3320/ESTR3306, IERG3810, 3830, IERG4004/FTEC4004, IERG4030/ESTR4320, IERG4060, IERG4080/ESTR4312, IERG4090/ESTR4302, IERG4100/ESTR4304, IERG4110/ESTR4314,	

	IERG4120/ESTR4328, IERG4130/CSCI4130/ESTR4306, IERG4150/ESTR4322, IERG4160, IERG4180/ESTR4308, IERG4190, 4210, 4220, 4230, IERG4300/ESTR4300, IERG4320/ESTR4324, IERG4330/ESTR4316, IERG4340, 4350, IERG4360/ESTR4326, IERG4831, 4841, 4851, 5020, IERG5040/ENGG5392, IERG5050, 5090, IERG5100/ENGG5303, IERG5110, 5130, 5140, IERG5154/ENGG5301, IERG5200 (or MATH4260), IERG5230, IERG5240/ENGG5383, IERG5250, 5254, 5280, 5290, IERG5300/ENGG5302, IERG5310, 5320, 5330, 5340, 5350, 5360, 5380, 5400, 5590, 5670		
(b)	MATH2060/2068, 3010, 3030, 3040, 3070, 3080, 3093, 3215, 3230, 3270, 3290, 3310, 3320, 3330, 3360, 4010, 4020, 4030, 4230, 4280		
		Total:	**84**

For students who select the Faculty Package of the Faculty of Science

		Units
1.	Science Faculty Package: Group C: MATH1010 or 1018 Group E: STAT1011 A course from the following Group A: LSCI1000 or 1001 or 1002 Group B: CHEM1070 or 1072 or 1280 Group D: PHYS1001 or 1002 or 1111	9
2.	Foundation Courses:	12
(a)	ENGG1110/ESTR1002, ENGG1120/ESTR1005(or MATH1030/1038), ENGG1130/ESTR1006 (or MATH2010/2018	
(b)	IERG2060/ESTR2304	
3.	Required Courses:	46
(a)	CSCI2100/ESTR2102, CSCI3160/ESTR3104, IERG1810, IERG2080/ESTR2306, IERG2310/ESTR2300, IERG2602, IERG3080/ESTR3308, IERG3310/ESTR3310, IERG3800, 3820, MATH1050/1058, 2020/2028, 2040/2048, 2050/2058, 2070/2078, 2230, MIEG2051/ESTR2360, MIEG2440/ESTR2362	
(b)	Research Component Courses[c]: IERG4998 and 4999	6
4.	Elective Courses: 11 units of elective courses, with at most 3 units to be counted from 4(b):	
(a)	CSCI2110 (or MATH3250), CSCI3130, CSCI3150/ESTR3102, CSCI3230/ESTR3108, CSCI3320, 5320 (or MATH3260), ENGG1820, ENGG5501,	

	IERG3010/ESTR3300, IERG3050, 3060, IERG3280/ESTR3302, IERG3300/ESTR3304 (or MATH4240), IERG3320/ESTR3306, IERG3810, 3830, IERG4004/FTEC4004, IERG4030/ESTR4320, IERG4060, IERG4080/ESTR4312, IERG4090/ESTR4302, IERG4100/ESTR4304, IERG4110/ESTR4314, IERG4120/ESTR4328, IERG4130/CSCI4130/ESTR4306, IERG4150/ESTR4322, IERG4160, IERG4180/ESTR4308, IERG4190, 4210, 4220, 4230, IERG4300/ESTR4300, IERG4320/ESTR4324, IERG4330/ESTR4316, IERG4340, 4350, IERG4360/ESTR4326, IERG4831, 4841, 4851, 5020, IERG5040/ENGG5392, IERG5050, 5090, IERG5100/ENGG5303, IERG5110, 5130, 5140, IERG5154/ENGG5301, IERG5200 (or MATH4260), IERG5230, IERG5240/ENGG5383, IERG5250, 5254, 5280, 5290, IERG5300/ENGG5302, IERG5310, 5320, 5330, 5340, 5350, 5360, 5380, 5400, 5590, 5670	
(b)	MATH2060/2068, 3010, 3030, 3040, 3070, 3080, 3093, 3215, 3230, 3270, 3290, 3310, 3320, 3330, 3360, 4010, 4020, 4030, 4230, 4280	
	Total:	**84**

In addition to fulfilling the above Major Programme Requirement, students may also challenge themselves by taking the following stream offered by the Faculty:

Engineering Leadership, Innovation, Technology and Entrepreneurship (ELITE) Stream[d]

Elective Courses:15 units of courses[e]:

(i) 12 units of ESTR courses of which at most 6 units of courses at 1000 or 2000 level and at least 6 units of courses at 3000 or 4000 level[f]

(ii) 3 units of BMEG/CENG/CSCI/ELEG/ENGG/IERG/MAEG/SEEM courses at 5000 level[g]

Explanatory Notes:

1. Students who have fulfilled the Major Programme Requirements of their respective Engineering programmes (or equivalent courses as approved by the Sub-Committee on Education Technologies) will be eligible to apply for exemption of 1 unit of University Core IT Requirement.
   Students are required to apply for the exemption. When exemption from a particular course is recognized, students can only be exempted from the course but not the units. Please follow the application procedures as announced by the IT Foundation Course Office at https://engg1000.cse.cuhk.edu.hk.
2. AIST/BMEG/CENG/CSCI/EEEN/ELEG/ENER/ENGG/ESTR/IERG/MAEG/ MATH/MIEG/SEEM/STAT required and major elective courses at 2000 and above level as well as MATH1030/1038 and 1050/1058 will be included in the calculation of Major GPA for honours classification, excluding courses in Faculty Package and Foundation courses, except IERG2060/ESTR2304, MATH1030/1038 and 2010/2018.
3. Students are advised to take some courses of the University Core Requirements or Major courses in summer sessions to reduce their course load in regular terms.

[a]	(i)	Non-JUPAS admittees and JUPAS admittees with HKDSE Mathematics Extended Modules I or II are required to attend a Mathematics Placement Test. Students who fail or are absent from the Placement Test will be required to take MATH1020 when they take MATH1510.
	(ii)	JUPAS admittees without HKDSE Mathematics Extended Modules I or II are required to take MATH1020 concurrently with MATH1510.
	(iii)	Students who fail MATH1510 in Term 1 will have to retake the course in Term 2. The pre-assigned course, ENGG1130, will also be dropped.
[b]	The Physics course shall be taken in accordance with students' HKDSE results or placement test results as follows:	
	(i)	Students who have attained Level 4 or above in HKDSE Mathematics (Compulsory Part) AND Level 4 or above in Physics or Level 5 or above in Combined Science with Physics Component shall take ENGG1310/ESTR1003 or PHYS1110.
	(ii)	Students with HKDSE results but did not attain the academic levels as stated in (i) shall take PHYS1003.
	(iii)	Students without HKDSE results shall sit for the placement test arranged by the Department of Physics. Students who pass the placement test shall take ENGG1310/ESTR1003 or PHYS1110. Students who fail or are absent from the placement test shall take PHYS1003.
[c]	Students who have declared to specialize in the ELITE Stream will be required to complete 6 units of ESTR4998 and 4999 to substitute for IERG4998 and 4999.	
[d]	Details of the entrance and coursework requirements, and declaration procedures for the ELITE Stream can be found at the ELITE website (https://www.erg.cuhk.edu.hk/erg/elite). Non-ELITE Engineering students may be allowed to take ESTR courses. Students are required to seek approval from their respective Major Programmes for using ESTR courses taken to fulfill the Major Programme Requirement. Details are available at the ELITE website.	
[e]	Students can use up to 9 units of courses which have been taken to fulfill the requirements of items 1 to 4 above to fulfill the elective requirements of the ELITE Stream. Item 3(b) Research Component Courses will not be included in these 9 units. A full list of ESTR courses is available at the ELITE website.	
[f]	Students can use BMEG/CENG/CSCI/ELEG/ENGG/IERG/MAEG/SEEM courses at 5000 level to substitute for ESTR courses at 3000 or 4000 level, subject to the approval of the Stream Director and the Associate Dean (Education).	
[g]	The requirement of at least 3 units of Engineering courses at 5000 level is a requirement for the ELITE Stream only. It should not be interpreted as a requirement of the Major Programme.	

For Students who select the Engineering Faculty Package

	Recommended Course Pattern	Units
First Year of Attendance	1st term Faculty Package: ENGG1110/ESTR1002 Major Required: MATH1510 Major Elective(s):	 3 3
	2nd term Faculty Package: ENGG1120/ESTR1005, ENGG1130/ESTR1006 Major Required: 1 Foundation Course Major Elective(s):	 6 3

Second Year of Attendance	1st term Major Required: IERG1810, IERG2060/ESTR2304, IERG2080/ESTR2306, MATH1050/1058, MIEG2051/ESTR2360 Major Elective(s):	13
	2nd term Faculty Package: Major Required: CSCI2100/ESTR2102, IERG2310/ESTR2300, IERG2602, 3820, MATH2020/2028, MIEG2440/ESTR2362 Major Elective(s):	14
Third Year of Attendance	1st term Major Required: IERG3080/ESTR3308, IERG3310/ESTR3310, IERG3800, MATH2050/2058, 2070/2078, 2230 Major Elective(s):	16
	2nd term Major Required: MATH2040/2048 Major Elective(s): Two Electives	3 5-6
Fourth Year of Attendance	1st term Major Required: CSCI3160/ESTR3104, IERG4998 Major Elective(s): Two Electives	6 5-6
	2nd term Major Required: IERG4999 Major Elective(s): One Elective	3 3
	Total (including Faculty Package):	**84**

For Students who select the Science Faculty Package

	Recommended Course Pattern	Units
First Year of Attendance	1st term Faculty Package: A course from Science Faculty Package Group A, B or D, STAT1011, 0-1 course from MATH1010 or 1018 Major Required: Major Elective(s):	6-9
	2nd term Faculty Package: ENGG1120/ESTR1005 (or MATH1030/1038), 0-1 course from MATH1010 or 1018 (if not taken) Major Required: MATH1050/1058 Major Elective(s):	3-6 3
Second Year of Attendance	1st term Major Required: ENGG1110/ESTR1002, IERG1810, IERG2060/ESTR2304, IERG2080/ESTR2306, MATH2010/2018 Major Elective(s):	13
	2nd term Major Required: CSCI2100/ESTR2102, IERG2602, MATH2020/2028, MIEG2440/ESTR2362 Major Elective(s):	10

Third Year of Attendance	1st term Major Required: IERG3080/ESTR3308, IERG3310/ESTR3310, MATH2050/2058, 2070/2078, 2230, MIEG2051/ESTR2360 Major Elective(s):	18
	2nd term Major Required: IERG2310/ESTR2300, IERG3820, MATH2040/2048 Major Elective(s): Two Electives	7 5-6
Fourth Year of Attendance	1st term Major Required: CSCI3160/ESTR3104, IERG3800, 4998 Major Elective(s): One Elective	7 3
	2nd term Major Required: IERG4999 Major Elective(s): One Elective	3 3
	Total (including Faculty Package):	**84**

Course List		
Course Code	*Course Title*	*Unit(s)*
ENGG1310	Engineering Physics: Electromagnetics, Optics and Modern Physics	3
ENGG1820	Engineering Internship	1
ENGG5301	Information Theory	3
ENGG5302	Random Processes	3
ENGG5303	Advanced Wireless Communications	3
ENGG5383	Applied Cryptography	3
ENGG5392	Lightwave System Technologies	3
ENGG5501	Foundations of Optimization	3
ESTR1003	Engineering Physics: Electromagnetics, Optics and Modern Physics	3
ESTR2002	Probability and Statistics for Engineers	3
ESTR2004	Discrete Mathematics for Engineers	3
ESTR2300	Principles of Communication Systems	3
ESTR2304	Basic Analog and Digital Circuits	3
ESTR2306	Introduction to Systems Programming	3
ESTR2360	Fourier Analysis with Engineering Applications	3
ESTR2362	Discrete Structures and Probability	3
ESTR3300	Digital Communications	3
ESTR3302	Networks: Technology, Economics, and Social Interactions	3
ESTR3304	Introduction to Stochastic Processes	3
ESTR3306	Social Media and Human Information Interaction	3
ESTR3308	Information and Software Engineering Practice	3
ESTR3310	Computer Networks	3
ESTR4300	Web-scale Information Analytics	3
ESTR4302	Networking Protocols and Systems	3
ESTR4304	Wireless Communication Systems	3
ESTR4306	Introduction to Cyber Security	3
ESTR4308	Network Software Design and Programming	3
ESTR4312	Building Scalable Internet-based Services	3
ESTR4314	Hands-on Wireless Communication	3
ESTR4316	Programming Big Data Systems	3

ESTR4320	Optical Communications	3
ESTR4322	Introduction to Cryptography	3
ESTR4324	Data Science in Practice	3
ESTR4326	Blockchain and Applications	3
ESTR4328	Functional Programming	3
IERG1080	Introduction to Python for Engineering Applications	3
IERG1810	Electronic Circuit Design Laboratory	1
IERG2060	Basic Analog and Digital Circuits	3
IERG2080	Introduction to Systems Programming	3
IERG2310	Principles of Communication Systems	3
IERG2602	Engineering Practicum	1
IERG3010	Digital Communications	3
IERG3050	Simulation and Statistical Analysis	3
IERG3060	Microcontrollers and Embedded Systems	3
IERG3080	Information and Software Engineering Practice	3
IERG3280	Networks: Technology, Economics, and Social Interactions	3
IERG3300	Introduction to Stochastic Processes	3
IERG3310	Computer Networks	3
IERG3320	Social Media and Human Information Interaction	3
IERG3800	Information Infrastructure Design Laboratory	1
IERG3810	Microcontrollers and Embedded Systems Laboratory	1
IERG3820	Communications Laboratory	1
IERG3830	Product Design and Development	3
IERG4004	E-payment Systems and Cryptocurrency Technologies	3
IERG4030	Optical Communications	3
IERG4060	Real-time Embedded Systems	3
IERG4080	Building Scalable Internet-based Services	3
IERG4090	Networking Protocols and Systems	3
IERG4100	Wireless Communication Systems	3
IERG4110	Hands-on Wireless Communication	3
IERG4120	Functional Programming	3
IERG4130	Introduction to Cyber Security	3
IERG4150	Introduction to Cryptography	3
IERG4160	Image and Video Processing	3
IERG4180	Network Software Design and Programming	3
IERG4190	Multimedia Coding and Processing	3
IERG4210	Web Programming and Security	3
IERG4220	Secure Software Engineering	3
IERG4230	Introduction to Internet of Things	3
IERG4300	Web-scale Information Analytics	3
IERG4320	Data Science in Practice	3
IERG4330	Programming Big Data Systems	3
IERG4340	Emerging Technologies in Information Engineering	3
IERG4350	Cloud Computing Security	3
IERG4360	Blockchain and Applications	3
IERG4831	Networking Laboratory I	2
IERG4841	Networking Laboratory II	2
IERG4851	Cyber Security Laboratory	1
IERG4998	Final Year Project I	3
IERG4999	Final Year Project II	3
IERG5020	Telecommunication Switching and Network Systems	3
IERG5040	Lightwave System Technologies	3

IERG5050	AI Foundation Models, Systems and Applications	3
IERG5090	Advanced Networking Protocols and Systems	3
IERG5100	Advanced Wireless Communications	3
IERG5110	Signal Processing in Wireless Communications and Sensing	3
IERG5130	Probabilistic Models and Inference Algorithms for Machine Learning	3
IERG5140	Lightwave Networks	3
IERG5154	Information Theory	3
IERG5200	Channel Coding and Modulation	3
IERG5230	Algorithms and Realization of Internet of Things Systems	3
IERG5240	Applied Cryptography	3
IERG5250	Edge AI and Applications	3
IERG5254	Network Information Theory	3
IERG5280	Mobile Networking	3
IERG5290	Network Coding Theory	3
IERG5300	Random Processes	3
IERG5310	Security and Privacy in Cyber Systems	3
IERG5320	Digital Forensics	3
IERG5330	Network Economics	3
IERG5340	IT Innovation and Entrepreneurship	3
IERG5350	Reinforcement Learning	3
IERG5360	Program Representation, Modeling and Understanding for Software Security	3
IERG5380	Quantum Information Processing	3
IERG5400	Theory of Probability	3
IERG5590	Advanced Topics in Blockchain	3
IERG5670	Computational Imaging Systems and Algorithms	3
MATH1010	University Mathematics	3
MATH1018	Honours University Mathematics	3
MATH1030	Linear Algebra I	3
MATH1038	Honours Linear Algebra I	3
MATH1050	Foundation of Modern Mathematics	3
MATH1058	Honours Foundation of Modern Mathematics	3
MATH1510	Calculus for Engineers	3
MATH2010	Advanced Calculus I	3
MATH2018	Honours Advanced Calculus I	3
MATH2020	Advanced Calculus II	3
MATH2028	Honours Advanced Calculus II	3
MATH2040	Linear Algebra II	3
MATH2048	Honours Linear Algebra II	3
MATH2050	Mathematical Analysis I	3
MATH2058	Honours Mathematical Analysis I	3
MATH2060	Mathematical Analysis II	3
MATH2068	Honours Mathematical Analysis II	3
MATH2070	Algebraic Structures	3
MATH2078	Honours Algebraic Structures	3
MATH2230	Complex Variables with Applications	3
MATH3010	Higher Geometry	3

MATH3030	Abstract Algebra	3
MATH3040	Fields and Galois Theory	3
MATH3070	Introduction to Topology	3
MATH3080	Number Theory	3
MATH3093	Fourier Analysis	3
MATH3215	Operations Research	3
MATH3230	Numerical Analysis	3
MATH3250	Discrete Mathematics	3
MATH3260	Graph Theory	3
MATH3270	Ordinary Differential Equations	3
MATH3290	Mathematical Modeling	3
MATH3310	Computational and Applied Mathematics	3
MATH3320	Foundation of Data Analytics	3
MATH3330	Big Data Computing	3
MATH3360	Mathematical Imaging	3
MATH4010	Functional Analysis	3
MATH4020	Calculus of Variations	3
MATH4030	Differential Geometry	3
MATH4230	Optimization Theory	3
MATH4240	Stochastic Processes	3
MATH4260	Coding Theory and Cryptography	3
MATH4280	Data Analytics in Design and Innovation	3
MIEG2051	Fourier Analysis with Engineering Applications	3
MIEG2440	Discrete Structures and Probability	3