Mathematics and Information Engineering
Applicable to students admitted in 2023-24

Major Programme Requirement

A student may be admitted to the programme directly or via the Mathematics Enrichment Stream un
Faculty of Science.[a]

Students are required to complete a minimum of 87 units of courses as follows:

For students admitted to the programme directly.

1. Faculty Package:
   ENGG1110/ESTR1002, MATH1030/1038, MATH1050/1058

2. Foundation Courses:

(a) MATH1010/1018[a]

(b) One of the following courses:
AIST1110, CSCI1120/ESTR1100, CSCI1130/ESTR1102, IERG1080

(c) One of the following courses:
ENGG1310, PHYS1001 or 1002 or 1111, STAT1011

3. Required Courses:

(a) CSCI2100/ESTR2102, CSCI3160/ESTR3104, IERG1810, IERG2060/ESTR2304, IERG2080/ESTR2306, IERG2310/ESTR2300, IERG3080/ESTR3308, IERG3310/ESTR3310, IERG3800, 3820, MATH2010/2018, 2020/2028, 2040/2048, 2050/2058, 2060/2068, 2070/2078, 2230, MIEG2051/ESTR2360, MIEG2440/ESTR2362

(b) Research Component Courses[b]:
IERG4998 and 4999

4. Elective Courses:
   12 units of elective courses, with at least 6 units from 4(a) and at least 3 units to be counted from 4(b) and at most 3 units from 4(c):

(a) CSCI3130, CSCI3150/ESTR3102, CSCI3230/ESTR3108, CSCI3320, 5030, 5150, 5320 (or MATH3260), ENGG1820, 5501, 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, 4240, 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, 5450, 5460, 5470, 5590, 5670

(b) MATH3020, 3030, 3040, 3060, 3070, 3080, 3093, 3215, 3230, 3270, 3290, 3310, 3320, 3330, 3340, 3360, 4010, 4020, 4030, 4230, 4280

(c) AIST course(s) at 3000 and 4000 level, CSCI course(s) at 3000 and above level, ENGG course(s) at 5000 level, FTEC course(s) at 3000 and above level, SEEM course(s) at 3000 and above level, STAT course(s) at 3000 and above level

Total:

For students admitted via the Faculty of Science (under the Mathematics Enrichment Stream).

1. Science Faculty Package:
   Group C: MATH1010/1018
   Group E: STAT1011
   A course from the following
   Group A: LSCI1001 or 1002
   Group B: CHEM1070 or 1072 or 1280
   Group D: PHYS1001 or 1002 or 1111 or 1113

2. Foundation Courses:
   ENGG1110/ESTR1002, MATH1030/1038, MATH1050/1058

3. Required Courses:

(a) CSCI2100/ESTR2102, CSCI3160/ESTR3104, IERG1810, IERG2060/ESTR2304, IERG2080/ESTR2306, IERG2310/ESTR2300, IERG3080/ESTR3308, IERG3310/ESTR3310, IERG3800, 3820, MATH2010/2018, 2020/2028, 2040/2048, 2050/2058, 2060/2068, 2070/2078, 2230, MIEG2051/ESTR2360, MIEG2440/ESTR2362

(b) 3 units to be counted from ONE of the following courses:
AIST1110, CSCI1120/ESTR1100, CSCI1130/ESTR1102, IERG1080

(c) Research Component Courses[b]:
IERG4998 and 4999

4. Elective Courses:
   9 units of elective courses, with at most 3 units to be counted from 4(b) , and at most 3 units from 4(c):

(a) CSCI3130, CSCI3150/ESTR3102, CSCI3230/ESTR3108, CSCI3320, 5030, 5150, 5320 (or MATH3260), ENGG1820, 5501, 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, 4240, 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, 5450, 5460, 5470, 5590, 5670

(b) MATH3020, 3030, 3040, 3060, 3070, 3080, 3093, 3215, 3230, 3270, 3290, 3310, 3320, 3330, 3340, 3360, 4010, 4020, 4030, 4230, 4280

(c) AIST course(s) at 3000 and 4000 level, CSCI course(s) at 3000 and above level, ENGG course(s) at 5000 level, FTEC course(s) at 3000 and above level, SEEM course(s) at 3000 and above level, STAT course(s) at 3000 and above level

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

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

Elective Courses:15 units of courses[d]:

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

(ii) 3 units of AIST/BMEG/CENG/CSCI/EEEN/ELEG/ENGG/IERG/MAEG/SEEM research pos 5000 level[f]

Explanatory Notes:

1. AIST/BMEG/CENG/CSCI/EEEN/ELEG/ENER/ENGG/ESTR/FTEC/IERG/MAEG/MATH required and major elective courses at 2000 and above level as well as MATH1030/1038 a included in the calculation of Major GPA for honours classification, excluding courses in Foundation courses.
2. Students are advised to take some courses of the University Core Requirements or Majc sessions to reduce their course load in regular terms.

[a] Students transferred to the programme can choose either set of the Major Programme Requi

[b] Students who fail MATH1010/1018 in Term 1 will have to retake the course in Term 2.

[c] Students who have declared to specialize in the ELITE Stream will be required to complete and 4999 to substitute for IERG4998 and 4999.

[d] Details of the entrance and coursework requirements, and declaration procedures for the E 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 requ from their respective Major Programmes for using ESTR courses taken to fulfill th 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 to fulfill the elective requirements of the ELITE Stream. Item 3(c) Research Componen included in these 9 units. A full list of ESTR courses is available at the ELITE website.

[f] Students can use AIST/BMEG/CENG/CSCI/EEEN/ELEG/ENGG/IERG/MAEG/SEEM r courses at 5000 level to substitute for ESTR courses at 3000 or 4000 level, subject to the ap Director and the Associate Dean (Education).

[g] The requirement of at least 3 units of Engineering courses at 5000 level is a requirement f only. It should not be interpreted as a requirement of the Major Programme.

For students admitted to the programme directly

	Recommended Course Pattern	Units

First Year of Attendance	1st term Faculty Package: ENGG1110/ESTR1002 Major Required: MATH1010/1018 Major Elective(s):	 3 3
	2nd term Faculty Package: MATH1030/1038, 1050/1058 Major Required: one course from ENGG1310, PHYS1001 or 1002 or 1111, STAT1011 Major Elective(s):	 6 3
Second Year of Attendance	1st term Major Required: one course from AIST1110, CSCI1120/ESTR1100, CSCI1130/ESTR1102, IERG1080, MATH2010/2018, 2040/2048, MIEG2051/ESTR2360 Major Elective(s):	 12
	2nd term Major Required: IERG1810, IERG2060/ESTR2304, IERG2080/ESTR2306, MATH2020/2028, MIEG2440/ESTR2362 Major Elective(s):	 13
Third Year of Attendance	1st term Major Required: CSCI2100/ESTR2102, IERG3800, MATH2050/2058, 2230 (or 2070/2078) Major Elective(s):	 10
	2nd term Major Required: IERG2310/ESTR2300, IERG3310/ESTR3310, IERG3820, MATH2060/2068, 2070/2078 (or 2230) Major Elective(s): One Elective	 13 3
Fourth Year of Attendance	1st term Major Required: CSCI3160/ESTR3104, IERG3080/ESTR3308, IERG4998 Major Elective(s): One Elective	 9 3
	2nd term Major Required: IERG4999 Major Elective(s): Two Electives	 3 6
	Total (including Faculty Package):	**87**

For students admitted via the Faculty of Science (under the Mathematics Enrichment Stream)

	Recommended Course Pattern	Units
First Year of Attendance	1st term Faculty Package: MATH1010/1018, a course from Science Faculty Package Group A, B or D Major Required: Major Elective(s):	 6
	2nd term Faculty Package: STAT1011 Major Required: MATH1030/1038, 1050/1058 Major Elective(s):	 3 6

Second Year of Attendance	1st term Major Required: ENGG1110/ESTR1002, MATH2010/2018, 2040/2048, MIEG2051/ESTR2360, one course from AIST1110, CSCI1120/ESTR1100, CSCI1130/ESTR1102, IERG1080 Major Elective(s):	15
	2nd term Major Required: IERG1810, IERG2060/ESTR2304, IERG2080/ESTR2306, MATH2020/2028, MIEG2440/ESTR2362 Major Elective(s):	13
Third Year of Attendance	1st term Major Required: CSCI2100/ESTR2102, MATH2050/2058, 2230 (or 2070/2078) Major Elective(s): One Elective	9 3
	2nd term Major Required: IERG2310/ESTR2300, IERG3310/ESTR3310, IERG3820, MATH2060/2068, 2070/2078 (or 2230) Major Elective(s): One Elective	13 3
Fourth Year of Attendance	1st term Major Required: CSCI3160/ESTR3104, IERG3080/ESTR3308, IERG3800, 4998 Major Elective(s):	10
	2nd term Major Required: IERG4999 Major Elective(s): One Elective	3 3
	Total (including Faculty Package):	**87**

Course List	
Course Code	*Course Title*
ESTR1002	Problem Solving By Programming
ENGG1310	Engineering Physics: Electromagnetics, Optics and Modern Physics
ENGG1820	Engineering Internship
ENGG5301	Information Theory
ENGG5302	Random Processes
ENGG5303	Advanced Wireless Communications
ENGG5383	Applied Cryptography
ENGG5392	Lightwave System Technologies
ENGG5501	Foundations of Optimization
ESTR1002	Problem Solving By Programming
ESTR1003	Engineering Physics: Electromagnetics, Optics and Modern Physics
ESTR2002	Probability and Statistics for Engineers
ESTR2004	Discrete Mathematics for Engineers
ESTR2300	Principles of Communication Systems
ESTR2304	Basic Analog and Digital Circuits
ESTR2306	Introduction to Systems Programming
ESTR2360	Fourier Analysis with Engineering Applications
ESTR2362	Discrete Structures and Probability
ESTR3300	Digital Communications
ESTR3302	Networks: Technology, Economics, and Social Interactions

ESTR3304	Introduction to Stochastic Processes
ESTR3306	Social Media and Human Information Interaction
ESTR3308	Information and Software Engineering Practice
ESTR3310	Computer Networks
ESTR4300	Web-scale Information Analytics
ESTR4302	Networking Protocols and Systems
ESTR4304	Wireless Communication Systems
ESTR4306	Introduction to Cyber Security
ESTR4308	Network Software Design and Programming
ESTR4312	Building Scalable Internet-based Services
ESTR4314	Hands-on Wireless Communication
ESTR4316	Programming Big Data Systems
ESTR4320	Optical Communications
ESTR4322	Introduction to Cryptography
ESTR4324	Data Science in Practice
ESTR4326	Blockchain and Applications
ESTR4328	Functional Programming
IERG1080	Introduction to Python for Engineering Applications
IERG1810	Electronic Circuit Design Laboratory
IERG2060	Basic Analog and Digital Circuits
IERG2080	Introduction to Systems Programming
IERG2310	Principles of Communication Systems
IERG3010	Digital Communications
IERG3050	Simulation and Statistical Analysis
IERG3060	Microcontrollers and Embedded Systems
IERG3080	Information and Software Engineering Practice
IERG3280	Networks: Technology, Economics, and Social Interactions
IERG3300	Introduction to Stochastic Processes
IERG3310	Computer Networks
IERG3320	Social Media and Human Information Interaction
IERG3800	Information Infrastructure Design Laboratory
IERG3810	Microcontrollers and Embedded Systems Laboratory
IERG3820	Communications Laboratory
IERG3830	Product Design and Development
IERG4004	E-payment Systems and Cryptocurrency Technologies
IERG4030	Optical Communications
IERG4060	Real-time Embedded Systems
IERG4080	Building Scalable Internet-based Services
IERG4090	Networking Protocols and Systems
IERG4100	Wireless Communication Systems
IERG4110	Hands-on Wireless Communication
IERG4120	Functional Programming
IERG4130	Introduction to Cyber Security
IERG4150	Introduction to Cryptography
IERG4160	Image Processing and Visual Understanding
IERG4180	Network Software Design and Programming
IERG4190	Multimedia Coding and Processing
IERG4210	Web Programming and Security
IERG4220	Secure Software Engineering
IERG4230	Introduction to Internet of Things
IERG4240	Positioning Principles and Technologies
IERG4300	Web-scale Information Analytics
IERG4320	Data Science in Practice

IERG4330	Programming Big Data Systems	
IERG4340	Emerging Technologies in Information Engineering	
IERG4350	Cloud Computing Security	
IERG4360	Blockchain and Applications	
IERG4831	Networking Laboratory I	
IERG4841	Networking Laboratory II	
IERG4851	Cyber Security Laboratory	
IERG4998	Final Year Project I	
IERG4999	Final Year Project II	
IERG5020	Telecommunication Switching and Network Systems	
IERG5040	Lightwave System Technologies	
IERG5050	AI Foundation Models, Systems and Applications	
IERG5090	Advanced Networking Protocols and Systems	
IERG5100	Advanced Wireless Communications	
IERG5110	Signal Processing in Wireless Communications and Sensing	
IERG5130	Probabilistic Models and Inference Algorithms for Machine Learning	
IERG5140	Lightwave Networks	
IERG5154	Information Theory	
IERG5200	Channel Coding and Modulation	
IERG5230	Algorithms and Realization of Internet of Things Systems	
IERG5240	Applied Cryptography	
IERG5250	Edge AI and Applications	
IERG5254	Network Information Theory	
IERG5280	Wireless and Mobile Networking	
IERG5290	Network Coding Theory	
IERG5300	Random Processes	
IERG5310	Security and Privacy in Cyber Systems	
IERG5320	Digital Forensics	
IERG5330	Network Economics	
IERG5340	IT Innovation and Entrepreneurship	
IERG5350	Reinforcement Learning	
IERG5360	Program Representation, Modeling and Understanding for Software Security	
IERG5380	Quantum Information Processing	
IERG5400	Theory of Probability	
IERG5450	AI for Science	
IERG5460	Multimodal Machine Learning	
IERG5470	Convex and Stochastic Optimization and their Applications	
IERG5590	Advanced Topics in Blockchain	
IERG5670	Computational Imaging Systems and Algorithms	
MATH1010	University Mathematics	
MATH1018	Honours University Mathematics	
MATH1030	Linear Algebra I	
MATH1038	Honours Linear Algebra I	
MATH1050	Foundation of Modern Mathematics	
MATH1058	Honours Foundation of Modern Mathematics	
MATH2010	Advanced Calculus I	
MATH2018	Honours Advanced Calculus I	
MATH2020	Advanced Calculus II	
MATH2028	Honours Advanced Calculus II	
MATH2040	Linear Algebra II	

MATH2048	Honours Linear Algebra II	
MATH2050	Mathematical Analysis I	
MATH2058	Honours Mathematical Analysis I	
MATH2060	Mathematical Analysis II	
MATH2068	Honours Mathematical Analysis II	
MATH2070	Algebraic Structures	
MATH2078	Honours Algebraic Structures	
MATH2230	Complex Variables with Applications	
MATH3020	Axiomatic Set Theory and Applications	
MATH3030	Abstract Algebra	
MATH3040	Fields and Galois Theory	
MATH3060	Mathematical Analysis III	
MATH3070	Introduction to Topology	
MATH3080	Number Theory	
MATH3093	Fourier Analysis	
MATH3215	Operations Research	
MATH3230	Numerical Analysis	
MATH3250	Discrete Mathematics	
MATH3260	Graph Theory	
MATH3270	Ordinary Differential Equations	
MATH3290	Mathematical Modeling	
MATH3310	Computational and Applied Mathematics	
MATH3320	Foundation of Data Analytics	
MATH3330	Big Data Computing	
MATH3340	Mathematics of Machine Learning	
MATH3360	Mathematical Imaging	
MATH4010	Functional Analysis	
MATH4020	Calculus of Variations	
MATH4030	Differential Geometry	
MATH4230	Optimization Theory	
MATH4240	Stochastic Processes	
MATH4260	Coding Theory and Cryptography	
MATH4280	Data Analytics in Design and Innovation	
MIEG2051	Fourier Analysis with Engineering Applications	
MIEG2440	Discrete Structures and Probability	