Computational Data Science
Applicable to students admitted in 2022-23

Major Programme Requirement

Students are required to complete a minimum of 75 units of courses as follows:

		Units
1.	Faculty Package: ENGG1110/ESTR1002, ENGG1120/ESTR1005 or MATH1030, MATH1010 or 1510[a]	9
2.	Foundation Courses: CSCI1120/ESTR1100, CSCI2100/ESTR2102, ENGG2440/ESTR2004, STAT2001[b], 2005, 2006	18
3.	Required Courses:	27
(a)	Algorithms and Computer Systems: AIST3020, CSCI3160/ESTR3104	
(b)	Machine Learning: Choose 3 units from the following: CSCI3230/ESTR3108, CSCI3320, RMSC4002, STAT4001	
(c)	Operating Systems: CSCI3150/ESTR3102	
(d)	Sampling: Choose 6 units from the following: STAT3003, 3006, 4010	
(e)	Statistical Inference: STAT3008, 4003	
(f)	Statistical Modeling: Choose 3 units from the following: STAT3005 or 4006	
4.	Research Component Courses[c]: CDAS4998, 4999	6
5.	Elective Courses Choose any ONE from the following four options:	15
(a)	**Computational Data Science** Choose at least 6 units from CSCI courses, at least 6 units from RMSC/STAT courses, and at least 9 units of courses at 4000 or above level: CENG5030, CSCI3170, CSCI3220/ESTR3110, CSCI3260, 3280, 3310, CSCI4130/IERG4130/ESTR4306, CSCI4160/ESTR4104, CSCI4180/ESTR4106, CSCI4230, CSCI4250/ESTR4122, CSCI4430/ESTR4120, CSCI5030, 5120, 5150, 5240, 5350, 5390, 5550, 5570, ENGG1130/ESTR1006 or MATH2010, ENGG5101, IERG4300/ESTR4300, RMSC4001, 4003, 4004, 4005, 4006, SEEM4630, 5330, 5680, STAT3001, 3007, 3009, 3210, 4002, 4004, 4005, 4008, 4012	
(b)	**Computational Physics** Required Courses: PHYS1122, 2401, 3061, 4061 Elective Courses: Choose 3 units from the following:	

PHYS1110, 1111

(c) **Computational Medicine**

Required Courses:
PHPC2017, 3024, 3034
Elective Courses:
(i) Choose 3 units from the following:
PHPC1001, 1012, 1017
(ii) Choose 3 units from the following:
CSCI3220/ESTR3110, CSCI3290, STAT3210

(d) **Computational Social Science**

Required Courses:
SOCI3102, 3238
Elective Courses:
Choose at least 9 units from the following:
SOCI2116, 2203, 3002, 3204, 3208, 3227, 3229, 3237

Total: 75

In addition to fulfilling the above Major Programme Requirement, students may also challenge themselves by taking the ELITE Stream offered by the Faculty of Engineering:

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. All courses at 2000 and above level listed in the Major Programme Requirement will be included in the calculation of Major GPA for honours classification.

[a] i) Non-JUPAS 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 in the same term 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] Non-JUPAS and JUPAS admittees without HKDSE Mathematics Extended Modules I or II may consider taking STAT1011 in advance for enriching statistics knowledge, if necessary.

[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 CDAS4998 and 4999.

[d] Details of the entrance and coursework requirements, and declaration procedures for the ELITE Stream can be found at the ELITE website (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 5 above to fulfill the elective requirements of the ELITE Stream. Item 4 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) of the Faculty of Engineering.
[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.

	Recommended Course Pattern	**Units**
First Year of Attendance	1st term	
	Faculty Package: ENGG1110/ESTR1002, MATH1010 or 1510	6
	Major Required: STAT2001	3
	Major Elective(s):	
	2nd term	
	Faculty Package: ENGG1120/ESTR1005 or MATH1030	3
	Major Required: STAT2005, 2006	6
	Major Elective(s):	
Second Year of Attendance	1st term	
	Major Required: CSCI1120/ESTR1100, ENGG2440/ESTR2004, STAT3008	9
	Major Elective(s):	
	2nd term	
	Major Required: AIST3020, CSCI2100/ESTR2102	6
	Major Elective(s):	
Third Year of Attendance	1st term	
	Major Required: CSCI3150/ESTR3102, CSCI3160/ESTR3104, CSCI3230/ESTR3108 or CSCI3320 or RMSC4002 or STAT4001 (if not taking in the 2nd term), one or two course(s) from STAT3003 or 3006 or 4010	9-12
	Major Elective(s): 3 units from major electives	3
	2nd term	
	Major Required: CSCI3230/ESTR3108 or CSCI3320 or RMSC4002 or STAT4001 (if not taken in the 1st term), one or two course(s) from STAT3003 or 3006 or 4010	6-9
	Major Elective(s): 3-6 units from major electives	3-6
Fourth Year of Attendance	1st term	
	Major Required: CDAS4998, STAT3005 or 4006, 4003	9
	Major Elective(s): 3-6 units from major electives	3-6
	2nd term	
	Major Required: CDAS4999	3
	Major Elective(s): 6-9 units from stream required courses/major electives	6-9
	Total (including Faculty Package):	**75**

Course List		
Course Code	*Course Title*	*Unit(s)*
AIST3020	Introduction to Computer Systems	3
CDAS4998	Final Year Project I	3
CDAS4999	Final Year Project II	3
CENG5030	Energy Efficient Computing	3
CSCI1120/ ESTR1100	Introduction to Computing Using C++	3
CSCI2100/ ESTR2102	Data Structures	3
CSCI3150/ ESTR3102	Introduction to Operating Systems	3
CSCI3160/ ESTR3104	Design and Analysis of Algorithms	3
CSCI3170	Introduction to Database Systems	3
CSCI3220/ ESTR3110	Algorithms for Bioinformatics	3
CSCI3230/ ESTR3108	Fundamentals of Artificial Intelligence	3
CSCI3260	Principles of Computer Graphics	3
CSCI3280	Introduction to Multimedia Systems	3
CSCI3290	Computational Imaging and Vision	3
CSCI3310	Mobile Computing and Applications Development	3
CSCI3320	Fundamentals of Machine Learning	3
CSCI4130/ IERG4130/ ESTR4306	Introduction to Cyber Security	3
CSCI4160/ ESTR4104	Distributed and Parallel Computing	3
CSCI4180/ ESTR4106	Introduction to Cloud Computing and Storage	3
CSCI4230	Computational Learning Theory	3
CSCI4250/ ESTR4122	Online Algorithms for Machine Learning and Optimizations	3
CSCI4430/ ESTR4120	Data Communication and Computer Networks	3
CSCI5030	Machine Learning Theory	3
CSCI5050	Bioinformatics and Computational Biology	3
CSCI5120	Advanced Topics in Database Systems	3
CSCI5150	Machine Learning Algorithms and Applications	3
CSCI5240	Combinatorial Search and Optimization with Constraints	3
CSCI5350	Advanced Topics in Game Theory	3
CSCI5390	Advanced GPU Programming	3
CSCI5550	Advanced File and Storage Systems	3
CSCI5570	Large Scale Data Processing Systems	3
ENGG1110/ ESTR1002	Problem Solving by Programming	3
ENGG1120/ ESTR1005	Linear Algebra for Engineers	3
ENGG1130/ ESTR1006	Multivariable Calculus for Engineers	3

ENGG2440/ ESTR2004	Discrete Mathematics for Engineers	3
ENGG5101	Advanced Computer Architecture	3
IERG4300/ ESTR4300	Web-Scale Information Analytics	3
MATH1010	University Mathematics	3
MATH1030	Linear Algebra I	3
MATH1510	Calculus for Engineers	3
MATH2010	Advanced Calculus I	3
PHPC1001	Foundations in Public Health	2
PHPC1012	Biological Basis of Health	3
PHPC1017	Principles of Infectious Diseases	1
PHPC2017	Epidemiology	3
PHPC3024	Economics and Financing in Healthcare Systems	3
PHPC3034	Applied Economics Evaluation in Health Care	3
PHYS1110	Engineering Physics: Mechanics and Thermodynamics	3
PHYS1111	Introduction to Mechanics, Fluids, and Waves (University Physics I)	3
PHYS1122	University Physics II – Introduction to Optics and Modern Physics	3
PHYS2401	Introduction to Astronomy and Astrophysics	3
PHYS3061	Introduction to Computer Simulation of Physical Systems	3
PHYS4061	Computational Physics	3
RMSC4001	Simulation Methods for Risk Management Science and Finance	3
RMSC4002	Financial Data Analytics with Machine Learning	3
RMSC4003	Statistical Modelling in Financial Markets	3
RMSC4004	Theory of Risk and Insurance	3
RMSC4005	Stochastic Calculus for Finance and Risk	3
RMSC4006	Operational Risk Management	3
SEEM4630	E-Commerce Data Mining	3
SEEM5330	Speech and Language Processing	3
SEEM5680	Text Mining Models and Application	3
SOCI2116	Criminals and the Law	3
SOCI2203	Social Problems and Social Policy	3
SOCI3002	Social Stratification	3
SOCI3102	Social Networks and Social Capital	3
SOCI3204	Sociology of Crime and Deviance	3
SOCI3208	Gender and Society	3
SOCI3227	Social Demography	3
SOCI3229	Quantitative Data Analysis	3
SOCI3237	Medical Sociology	3
SOCI3238	Digital Sociology	3
STAT2001	Basic Concepts in Statistics and Probability I	3
STAT2005	Programming Languages for Statistics	3
STAT2006	Basic Concepts in Statistics and Probability II	3
STAT3001	Foundation of Financial and Managerial Statistics	3
STAT3003	Survey Methods	3
STAT3005	Nonparametric Statistics	3
STAT3006	Statistical Computing	3
STAT3007	Introduction to Stochastic Processes	3
STAT3008	Applied Regression Analysis	3
STAT3009	Recommender Systems	3
STAT3210	Statistical Techniques in Life Sciences	3

STAT4001	Data Mining and Statistical Learning	3
STAT4002	Applied Multivariate Analysis	3
STAT4003	Statistical Inference	3
STAT4004	Actuarial Science	3
STAT4005	Time Series	3
STAT4006	Categorical Data Analysis	3
STAT4008	Survival Modelling	3
STAT4010	Bayesian Learning	3
STAT4012	Statistical Principles of Deep Learning with Business Applications	3