Double Major Bachelor of Science (Honours) Programme in Environmental Earth Systems Science and Mathematical Sciences

Home School: Asian School of the Environment

Curriculum Overview

The core courses equip students with a firm foundation in their two majors. Students can then choose from a range of prescribed electives in their interests.

To graduate, students must complete three (3) categories of requirements, totalling at least 144 Academic Units (AUs):

- Major Requirements (105AUs)
- Interdisciplinary Collaborative Core (33AUs)
- Broadening & Deepening Electives (6AUs)

Summary Table of Graduation Requirements

Major	**Major Requirement (AUs)**				**Interdisciplinary Collaborative Core (AUs)**			**Broadening & Deepening Electives (AUs)**	**Total AUs**
	Major Core	Common Core	Major Prescribed Electives	Final Year Project	Common Core	Professional Series	Care, Serve & Learn		
EESS	27	0	21	10	14	16 (11)	3	6 (11)	144 (144)
MATH	40		7						

- AU in parentheses indicate AUs for students taking the Professional Attachment (PA) track.

Students to take the following ICC courses	AU
CC0001 Inquiry & Communication in an Interdisciplinary World	2
CC0003 Ethics & Civics in a Multicultural World	2
ML0004 Career Design & Workplace Readiness in the V.U.C.A World	2
CC0015 Health & Wellbeing	2
CC0006 Sustainability: Society, Economy & Environment	3
CC0007 Science & Technology for Humanity	3
CCXXXX Care, Serve, Learn	*3*
MLXXXX Profession Preparation	*1*
ES0002 Fundamentals of Data Science for Earth and Environmental Systems Science: ICC	2
ES0238 Scientific Writing for Non-Scientist: ICC	3
ES4003 Professional Internship	10 (5)
Total	**33 (28)**

Students to take the following Major Core courses	AU
Environmental Earth Systems Science Major (27AUs)	
ES0001 The Physical Environments of Singapore	3
ES0138 Introduction to Scientific Writing	2
ES1001 E2S2 Environment and Society	4
ES1003 E2S2 Solid Earth	4
ES1007 Climate Change	3
ES2001 Computational Earth Systems Science	4
ES2003 E2S2 Biosphere	4
ES2802 GIS and the Earth System	3
Mathematical Sciences (40AUs)	
MH1100 Calculus I	4
MH1200 Linear Algebra I	4
MH1300 Foundations of Mathematics	4
MH1101 Calculus II	4
MH1201 Linear Algebra II	4
MH2100 Calculus III	4
MH2500 Probability	4
MH2510 Statistics I	4
MH3100 Real Analysis I	4
MH3110 Ordinary Differential Equations	4
Total	**67**

Students to take the following Major Prescribed Electives		AU
Environmental Earth Systems Science Major: To read 21AUs		
ES2002 Earth Materials		3
ES2004 Sedimentary Geology		3
ES2203 Global Environmental Politics and Governance		3
ES2301 Principles of Heredity and Genetics		3
ES2303 Introduction to Ecology		3
ES3202 Resilient Urban Systems		3
ES3801 Biogeochemistry (alternating years)		3
ES3802 The Urban Environ: Issues, assessment, & management		3
ES4201 Environmental Management and Valuation		3
ES4303 Marine and Aquatic Ecology		3
ES4304 Eyes on Earth – Satellite Remote Sensing		3
ES4901 Oceanography (alternating years)		3
Other advanced ASE MPE with appropriate pre-reqs and instructor approval		3
Mathematical Sciences Major: To read 7AUs (A specialisation area is fulfilled by completing at least 15 AU from the respective list of courses.)		
Computational Mathematics and Modelling Specialisation	MH3101 Complex Analysis	4
	MH3300 Graph Theory	4
	MH3320 Dynamical System Theory with Chaos and Fractals (NEW)	4
	MH3400 Algorithms for the Real World	4
	MH3401 Signal and Noise in Biology	3
	MH3512 Stochastic Processes	4
	MH3515 Stochastic Geometry (NEW)	4
	MH3520 Mathematics of Deep Learning	4
	MH3700 Numerical Analysis I	4
	MH3701 Basic Optimization	4
	MH4100 Real Analysis II	4
	MH4110 Partial Differential Equations	4
	MH4302 Theory of Computing	4
	MH4310 Coding Theory	4
	MH4311 Cryptography	4
	MH4514 Financial Mathematics	4
	MH4517 Data Applications in Natural Sciences	4
	MH4518 Simulation Techniques in Finance	4
	MH4520 High Dimensional Probability	4
	MH4521 Reinforcement Learning	4
	MH4601 Differential Geometry	4
	MH4700 Numerical Analysis II	4
	MH4701 Mathematical Programming	4
	MH4712 Geometric Methods in Mathematical Physics (NEW)	4

Cryptography and Cybersecurity Specialisation	MH3400 Algorithms for the Real World	4
	MH3511 Data Analysis with Computer	3
	MH3701 Basic Optimization	4
	MH4110 Partial Differential Equations	4
	MH4300 Combinatorics	4
	MH4311 Cryptography	4
	MH4500 Time Series Analysis	4
	MH4700 Numerical Analysis II	4
Data Analytics and Statistical Learning Specialisation	MH3400 Algorithms for the Real World	4
	MH3510 Regression Analysis	4
	MH3511 Data Analysis with Computer	3
	MH3512 Stochastic Processes	4
	MH3515 Stochastic Geometry (NEW)	4
	MH3520 Mathematics of Deep Learning	4
	MH4320 Computational Economics	4
	MH4500 Time Series Analysis	4
	MH4501 Multivariate Analysis	4
	MH4510 Statistical Learning and Data Mining	4
	MH4511 Sampling & Survey	4
	MH4512 Clinical Trials	4
	MH4513 Survival Analysis	4
	MH4514 Financial Mathematics	4
	MH4515 Applied Bayesian Statistics	4
	MH4516 Applied Categorical Data Analysis	4
	MH4517 Data Applications in Natural Sciences	4
	MH4518 Simulation Techniques in Finance	4
	MH4519 Financial Econometrics	4
	MH4520 High Dimensional Probability	4
	MH4701 Mathematical Programming	4
	MH4702 Probabilistic Methods in OR	4
Financial Technology with Quantitative Analysis Specialisation	MH3512 Stochastic Processes	4
	MH3520 Mathematics of Deep Learning	4
	MH3700 Numerical Analysis I	3
	MH3701 Basic Optimization	4
	MH4110 Partial Differential Equations	4
	MH4320 Computational Economics	4
	MH4500 Time Series Analysis	4
	MH4514 Financial Mathematics	4
	MH4518 Simulation Techniques in Finance	4
	MH4519 Financial Econometrics	4
	MH4520 High Dimensional Probability	4
	MH4700 Numerical Analysis II	4
	MH4702 Probabilistic Methods in OR	4

	MH4712 Geometric Methods in Mathematical Physics (NEW)	4
Pure Mathematics Specialisation	MH2220 Algebra I	3
	MH3101 Complex Analysis	4
	MH3210 Number Theory	4
	MH3220 Algebra II	4
	MH3300 Graph Theory	4
	MH3515 Stochastic Geometry (NEW)	4
	MH4100 Real Analysis II	4
	MH4200 Abstract Algebra II	4
	MH4300 Combinatorics	4
	MH4301 Set Theory and Logic	4
	MH4302 Theory of Computing	4
	MH4310 Coding Theory	4
	MH4311 Cryptography	4
	MH4520 High Dimensional Probability	4
	MH4601 Differential Geometry	4
	Total	**28**

Detailed Curriculum Structure

Course Code and Title	Course Type	No. of hours per week				AUs	Prerequisite / Remarks
		Lec	Tut	Lab	Total		
Year 1 Semester 1							
ES0138 Introduction to Scientific Writing	Core	-	2	-	-	2	
ES1001 E2S2 Environment and Society	Core	2	2	0	4	4	
CC0001 Inquiry and Communication in an Interdisciplinary World	ICC-CC	-	2	-	2	2	
CC0003 Ethics & Civics in a Multi-Cultural World	ICC-CC	-	2	-	2	2	
MH1100 Calculus I	Core	3	1	-	4	4	
MH1200 Linear Algebra I	Core	3	1	-	4	4	
MH1300 Foundations of Mathematics	Core	3	1	-	4	4	
HW0001 Introduction to Academic Communication	-					0	For students who fail QET
Total						**22**	
Year 1 Semester 2							
ES1003 E2S2 Solid Earth	Core	3	-	3	6	4	
ES2003 Biosphere	Core	2	2	-	4	4	
ML0004 Design Your Life & Career	ICC-CC	-	2	-	2	2	

CC0015 Healthy Living & Mental Wellbeing	ICC-CC	-	2	-	2	2	
MH1101 Calculus II	Core	3	1	-	4	4	MH1100 or CY1601
MH1201 Linear Algebra II	Core	3	1	-	4	4	MH1200
Total						**20**	

Course Code and Title	**Course Type**	**No. of hours per week**				**AUs**	**Prerequisite / Remarks**
		Lec	**Tut**	**Lab**	**Total**		
Year 2 Semester 1							
ES2001 Computational Earth Systems Science	Core	3	-	3	6	4	ES1001, ES1003, ES2003, ES1007
ES2802 GIS and the Earth System	Core	-	3	-	3	3	
CC0007 Science & Technology for Humanity	ICC-CC	-	3	-	3	3	
MH2100 Calculus III	Core	3	1	-	4	4	MH1101 or MH1802 or MH1805
MH2500 Probability	Core	3	1	-	4	4	MH1100 AND MH1101 or MH1802 or CY1601 or MH1805
MH3100 Real Analysis I	Core	3	1	-	4	4	MH1100 AND MH1101 or CY1601 or MH1802
Total						**22**	
Year 2 Semester 2							
ES0001 The Physical Environments of Singapore	Core	2	-	3	5	3	
ES1007 Climate Change	Core	2	1	-	3	3	
CC0006 Sustainability: Human, Social, Economic & Environment	ICC-CC	-	3	-	3	3	
CCXXXX Care, Serve, Learn	ICC-CSL					3	
MH2510 Statistics I	Core	3	-	2	5	4	MH2500
MH3110 Ordinary Differential Equations	Core	3	1	-	4	4	MH2100 or CY1602
Total						**20**	

Course Code and Title	**Course Type**	**No. of hours per week**				**AUs**	**Prerequisite / Remarks**
		Lec	**Tut**	**Lab**	**Total**		

Year 3 Semester 1							
MLxxxx Professional Preparation	ICC-PS					1	
MPE	MPE					3	
MPE	MPE					3	
MPE	MPE					3	
MPE	MPE					3	
BDE	BDE					3	
Total						**16**	
Year 3 Semester 2							
ES0002 Fundamentals of Data Science for Environmental Earth Systems Science	ICC-PS	1.5	1.5	-	-	3	ES2001
ES0238 Scientific Writing for Non-Scientists	ICC-PS	-	2	-	-	2	ES0138
MPE	MPE					4	
MPE	MPE					3	
MPE	MPE					3	
BDE	BDE					3	
Total						**18**	

Course Code and Title	**Course Type**	**No. of hours per week**				**AUs**	**Prerequisite / Remarks**
		Lec	**Tut**	**Lab**	**Total**		
Year 4 Semester 1							
ES4003 Professional Internship	ICC-PS					10	
Total						**10**	
Year 4 Semester 2							
ES4002 Final Year Project	Core					10	
MPE	MPE					3	
MPE	MPE					3	
Total						**16**	
Grand Total AU						**144**	