Double Major Bachelor of Science (Honours) Programme in Biological Sciences and Mathematical Sciences

Home School: School of Biological Sciences

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 143 Academic Units (AUs):

- Major Requirements (104 AUs)
- Interdisciplinary Collaborative Core (33 AUs)
- Broadening & Deepening Electives (6 AUs)

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		
BS	36	0	9	12	14	16	3	6	143
MATH	40		7						

Students to take the following ICC courses	AU
CC0001 Inquiry & Communication in an Interdisciplinary World	2
CC0003 Ethics and Civics in a Multi-Cultural World	2
CC0015 Health & Wellbeing	2
ML0004 Career Design & Workplace Readiness in the V.U.C.A World	2
CC0007 Science & Technology for Humanity	3
CC0006 Sustainability: Society, Economy and Environment	3
CCXXXX Care, Serve, Learn	3
MLXXXX Profession Preparation	1
BS0004 Introduction to Data Science	3
HW0218 Communication Across the Sciences	2
BS4227 Professional Internship	10
Total	**33**

Students to take the following Major Core courses	AU
Biological Sciences Major (36AUs)	
BS1012 Foundations of Chemistry I	3
BS1013 Foundations of Chemistry II	3
BS1016 Physiology	3
BS1005 Biochemistry I	3
BS1006 Principles of Genetics	3
BS1007 Molecular and Cell Biology I	3
BS1009 Introduction to Computational Thinking	3
BS1100 Molecular and Cell Biology Techniques Level 1	3
BS2002 Microbiology	3
BS2003 Biochemistry II	3
BS2028 Biophysical methods applied to biological sciences	3
BS2004 Molecular & Cell Biology II	3
Mathematical Sciences Major (40AUs)	
MH1100 Calculus 1	4
MH1200 Linear Algebra 1	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	**76**

Students to take the following Major Prescribed Electives	AU
Biological Sciences Major: To read 9AUs	
BS2010 Bioimaging	3
BS2020 Mathematics and Physics for the Structural Biologist	3
BS2021 RNA Structures & RNA based Drug Development	3
BS2025 One Health	3
BS2011 Equations of Life	3
BS3001 Neurobiology	3
BS3006 Bioentrepreneurship	3
BS3008 Computer Aided Drug Discovery	3
BS3013 Drug discovery & development, biotechnology	3
BS3014 Biological foundations of behavior	3
BS3022 Protein Trafficking	3
BS3025 NMR in Structural Biology	3
BS3028 Natural Products in Medicinal Chemistry	3
BS3036 Fundamentals of Immunology- concepts and experiments	3
BS3104 Pathology (病理学)	3
BS3203 Reshaping Healthcare with Engineering and Digital Revolution	3
BS3332 Undergraduate Advanced Experimental Biology (UAEB) Workshop (Series I) – Methods in Histology	3
BS3335 Undergraduate Advanced Experimental Biology (UAEB) Workshop (Series I) – Protein behavior in health and disease – biophysical tools	3
BS3340 Undergraduate Advanced Experimental Biology (UAEB) Workshop (Series I) – Science of aging and life extension in C. elegans	3
BS4018 Biology of Aging and Neurodegeneration	3
BS4019 Discovery and Development of Therapeutic Antibodies	3
BS4206 Medical Device Related Requirements and Regulations	3
BS1200 Understanding Singapore Healthcare System	3
BS2023 Regulatory Control of Healthcare Products and Medical Devices	3
BS2024 Evolution in Health and Disease	3
BS2100 Molecular and Cell Biology Techniques Level 2	3
BS3003 Developmental biology	3
BS3004 Cancer biology and Therapy	3
BS3018 Plant biology	3
BS3021 Bioimaging Techniques in EM	3
BS3027 Light and Biomolecule Behavior in Health and Disease	3
BS3037 Virology	3
BS3038 Intellectual Property Rights Related to BioBusiness	3
BS3202 Commercialization of Molecular and Cell Biology Techniques	3
BS3331 Undergraduate Advanced Experimental Biology (UAEB) Workshop (Series I) – Applied Immunology	3

BS3338 Undergraduate Advanced Experimental Biology (UAEB) Workshop (Series II) – Effect of Anti-mitotic Drugs on Cancer Cells		3
BS3342 Undergraduate Advanced Experimental Biology (UAEB) Workshop (Series II) – Role of Actin cytoskeleton regulators in metastasis		3
BS3344 Undergraduate Advanced Experimental Biology (UAEB) Workshop (Series II) – Macromolecular X-ray Crystallography		3
BS3354 UAEB- New CRISPR-Cas systems for Precision Genome Engineering		3
BS4002 Current topics in cell biology		3
BS4010 Synthetic Biology		3
BS4014 Molecular Basis of Diseases		3
BS4015 Plant Biotechnology		3
BS4017 High-Throughput Bioinformatics		3
BS2901 Research Experience		3
Mathematical Sciences Major: To read 7 AUs (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
	MH3400 Algorithms for the Real World	4
	MH3511 Data Analysis with Computer	3

Cryptography and Cybersecurity Specialisation	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	16

- Specialisation can be fulfilled through Major Prescribed Electives and/or BDEs. FGO is not applicable to courses that count towards the requirement for specialisation. The same course cannot be used to count towards two different specialisations.

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							
BS1012 Foundations of Chemistry I	Core	3	1	3		3	
BS1016 Physiology	Core	1	2	-	3	3	
CC0001 Inquiry & Communication in an Interdisciplinary World	ICC-CC	-	2	-	2	2	
CC0003 Ethics & Civics in a Multicultural 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							
BS1013 Foundations of Chemistry II	Core	3	1	-	4	3	
BS1005 Biochemistry I	Core	2	1	4		3	
BS1006 Principles of Genetics	Core	2	1	-	3	3	

BS1007 Molecular and Cell Biology I	Core	2	1	-	3	3	
BS1009 Introduction to Computational Thinking	Core	-	1	2		3	
MH1101 Calculus II	Core	3	1	-	4	4	MH1100 or CY1601
MH1201 Linear Algebra II	Core	3	1	-	4	4	MH1200
Total						**23**	

Course Code and Title	**Course Type**	**No. of hours per week**				**AUs**	**Prerequisite / Remarks**
		Lec	**Tut**	**Lab**	**Total**		
Year 2 Semester 1							
BS2002 Microbiology	Core	2	2	-	4	3	
BS2003 Biochemistry II	Core	2	1	4		3	BS1005
BS2028 Biophysical methods applied to biological sciences	Core	2	1	3		3	BS1012 & BS1013
BS0004 Introduction to Data Science	ICC-PS	1	-	2		3	BS1008 & BS1009
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
Total						**20**	
Year 2 Semester 2							
BS1100 Molecular and Cell Biology Techniques Level 1	Core	-	1	6		3	
BS2004 Molecular & Cell Biology II	Core	2	1	-	3	3	BS1007
CC0015 Health & Wellbeing	ICC-CC	-	2	-	2	2	
ML0004 Career Design & Workplace Readiness in the V.U.C.A World	ICC-CC	-	2	-	2	2	
HW0218 Communication Across the Sciences	ICC-PS	-	2	-	2	2	
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 Profession Preparation	ICC-PS					1	
CC0006 Sustainability: Society, Economy and Environment	ICC-CC	-	3	-	3	3	
CC0007 Science & Technology for Humanity	ICC-CC	-	3	-	3	3	
CCXXXX Care, Serve, Learn	ICC-CSL					3	
MPE						3	
MPE						3	
BDE						3	
Total						**19**	
Year 3 Semester 2							
BS4227 Professional Internship	ICC-PS					10	
Total						**10**	

Course Code and Title	**Course Type**	**No. of hours per week**				**AUs**	**Prerequisite / Remarks**
		Lec	**Tut**	**Lab**	**Total**		
Year 4 Semester 1							
MPE						3	
MPE						3	
MPE						4	
BDE						3	
MH3100 Real Analysis I	Core	3	1	-	4	4	MH1100 and MH1101 or CY1601 or MH1802
Total						**17**	
Year 4 Semester 2							
BS4020 FYP	Core					12	
Total						**12**	
Grand Total AU						**143**	