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

Home School: School of Physical and Mathematical 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 141 Academic Units (AUs):

- Major Requirements (102AUs)
- 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		
MATH	40	3	7	8	14	16	3	6	141
CHEM	35		9						

- Common Core: PS0001

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*
PS0002 Introduction to Data Science and Artificial Intelligence	3
HW0218 Communication Across the Sciences	2
MH4912 Professional Internship	10
Total	**33**

Students to take the following Major Core and Common Core courses	AU
Mathematical Sciences Major (43AUs)	
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
PS0001 Introduction to Computational Thinking	3
MH2500 Probability	4
MH2510 Statistics I	4
MH3100 Real Analysis I	4
MH3110 Ordinary Differential Equations	4
Chemistry Major (35AUs)	
CM1001 Foundations of Chemistry I	4
CM1002 Foundations of Chemistry II	4
CM2011 Analytical and Bioanalytical Chemistry	3
CM2021 Inorganic and Bioinorganic Chemistry	3
CM2061 Chemistry & Biological Chemistry I	3
CM2031 Organic and Bioorganic Chemistry	3
CM2041 Physical and Biophysical Chemistry 1	3
CM2062 Chemistry & Biological Chemistry II	3
Read any 2 courses: ^CM3011 Chemical Spectroscopy and Applications ^CM3021 Organometallic Chemistry ^CM3031 Organic Reaction Mechanisms and Synthesis ^CM3041 Physical and Biophysical Chemistry 2	6
Read any 1 laboratory course: CM3061 Chemistry & Biological Chemistry III CM3062 Chemistry & Biological Chemistry IV	3
Total	**78**

Students to take the following Major Prescribed Electives		AU
Mathematical Sciences Major: To read 7AUs (A specialisation area is fulfilled by completing at least 7 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
Chemistry Major: To read 9AUs		
CM4011 Advanced Analytical Chemistry		3
CM4012 Structural Determination		3
CM4013 Current Topics in Analytical Chemistry		3
CM4021 Current Topics in Inorganic Chemistry		3
CM4031 Asymmetric Synthesis		3
CM4032 Current Topics in Synthetic Organic Chemistry		3
CM4033 Metal Mediated Reactions		3
CM4042 Chemical Kinetics and Dynamics		3
CM4043 Molecular Modelling: Principles and Applications		3
CM4044 Artificial Intelligence in Chemistry		3
CM4053 Pharmaceutical Chemistry		3
CM4061 Material Chemistry		3
CM4062 Polymer Chemistry		3
CM4063 Nanoscience and Nanotechnology		3
	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							
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	
PS0001 Introduction to Computational Thinking	Core	-	1	2		3	
CC0003 Ethics & Civics in a Multicultural World	ICC-CC	-	2	-	2	2	
CM1001 Foundations of Chemistry I	Core	3	-	3		4	
HW0001 Introduction to Academic Communication	-					0	For students who fail QET
Total						**21**	
Year 1 Semester 2							
MH1101 Calculus II	Core	3	1	-	4	4	MH1100 or CY1601
MH1201 Linear Algebra II	Core	3	1	-	4	4	MH1200

PS0002 Introduction to Data Science and Artificial Intelligence	ICC-PS	2	1	1		3	PS0001
CC0001 Inquiry & Communication in an Interdisciplinary World	ICC-CC	-	2	-	2	2	
CC0015 Health & Wellbeing	ICC-CC	-	2	-	2	2	
CM1002 Foundations of Chemistry II	Core	3	-	3		4	
Total						**19**	

Course Code and Title	**Course Type**	**No. of hours per week**				**AUs**	**Prerequisite / Remarks**
		Lec	**Tut**	**Lab**	**Total**		
Year 2 Semester 1							
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
ML0004 Career Design & Workplace Readiness in the V.U.C.A World	ICC-CC					2	
CC0006 Sustainability: Society, Economy & Environment	ICC-CC	-	3	-	3	3	
CM2011 Analytical and Bioanalytical Chemistry	Core	3	-	-	3	3	CM1001
CM2021 Inorganic and Bioinorganic Chemistry	Core	3	-	-	3	3	CM1001
CM2061 Chemistry & Biological Chemistry I	Core	-	-	6	6	3	CM1001 & CM1002
Total						**22**	
Year 2 Semester 2							
MH2510 Statistics I	Core	3	-	2		4	MH2500
MH3110 Ordinary Differential Equations	Core	3	1	-	4	4	MH2100 or CY1602
CC0007 Science & Technology for Humanity	ICC-CC	-	3	-	3	3	
CCXXXX Care, Serve, Learn	ICC-CSL					3	
CM2031 Organic and Bioorganic Chemistry	Core	3	-	-	3	3	CM1002
CM2041 Physical and Biophysical Chemistry 1	Core	3	-	-	3	3	CM1001 and CM1804
CM2062 Chemistry & Biological Chemistry II	Core	-	-	6	6	3	CM1001
Total						**23**	

Course Code and Title	Course Type	No. of hours per week				AUs	Prerequisite / Remarks
		Lec	Tut	Lab	Total		
Year 3 Semester 1							
MH3100 Real Analysis I	Core	3	1	-	4	4	MH1100 AND MH1101 or CY1601 or MH1802
HW0218 Communication Across the Sciences	ICC-PS					2	
XXXXXX Profession Preparation	ICC-PS					1	
Choose 1: ^CM3011 Chemical Spectroscopy and Applications OR ^CM3021 Organometallic Chemistry OR ^CM3031 Organic Reaction Mechanisms and Synthesis OR ^CM3041 Physical and Biophysical Chemistry 2	Core	3	-	-	3	3	CM3011-pre-req CM2021+CM2031 CM3021-pre-req CM2021 CM3031-pre-req CM2031 CM3041-pre-req CM2041
CM3062 Chemistry & Biological Chemistry IV	Core	-	-	6	6	0#/3	CM3062-pre-req CM2062 Choose 1: CM3062 (Sem 1) OR #CM3061 (Sem 2)
MPE	MPE					3	
BDE	BDE					3	
Total						**16/19**	
Year 3 Semester 2							
Choose 1: ^CM3011 Chemical Spectroscopy and Applications OR ^CM3021 Organometallic Chemistry OR ^CM3031 Organic Reaction Mechanisms and Synthesis OR ^CM3041 Physical and Biophysical Chemistry 2	Core	3	-	-	3	3	CM3011-pre-req CM2021+CM2031 CM3021-pre-req CM2021 CM3031-pre-req CM2031 CM3041-pre-req CM2041
CM3061 Chemistry & Biological Chemistry III	Core	-	-	6	6	0#/3	CM3061 pre-req: CM2061 Choose 1:

							#CM3062 (Sem 1) OR CM3061 (Sem 2)
MPE	MPE					3	
MPE	MPE					3	
BDE	BDE					3	
Total						**12/15**	

Course Code and Title	**Course Type**	**No. of hours per week**				**AUs**	**Prerequisite / Remarks**
		Lec	**Tut**	**Lab**	**Total**		
Year 4 Semester 1							
MH4912 Professional Internship	ICC-PS					10	
Total						**10**	
Year 4 Semester 2							
MH4XXX Final Year Project	Core					8	
MPE	MPE					3	
MPE	MPE					4	
Total						**15**	
Grand Total AU						**141**	