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

Home School: School of Chemistry, Chemical Engineering and Biotechnology

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 (104AUs)
- 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		
CHEM	35	3	9	10	14	16	3	6	143
MATH	40		7						

- 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
CM4081 Professional Internship	10
Total	**33**

Students to take the following Major Core and Common Core courses	AU
Chemistry Major (38AUs)	
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
PS0001 Introduction to Computational Thinking	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
Mathematical Sciences Major (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	**78**

Note:
^ CM3011, CM3021, CM3031, CM3041 are offered in Semesters 1 and 2
MH1100, MH1101, MH1200, MH1201, and MH2100 will be included under MATH core

Students to take the following Major Prescribed Electives		AU
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
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	**16**

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							
CM1001 Foundations of Chemistry I	Core	3	-	3	6	4	
PS0001 Introduction to Computational Thinking	Core	-	1	2	3	3	Common Core
CC0001 Inquiry & Communication in an Interdisciplinary World	ICC-CC	-	2	-	2	2	
CC0015 Health & Wellbeing	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						**23**	
Year 1 Semester 2							
CM1002 Foundations of Chemistry II	Core	3	-	3	6	4	

PS0002 Introduction to Data Science and Artificial Intelligence	ICC-PS	-	1	1	2	3	PS0001
CC0003 Ethics & Civics in a Multi-Cultural World	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						**17**	

Course Code and Title	**Course Type**	**No. of hours per week**				**AUs**	**Prerequisite / Remarks**
		Lec	**Tut**	**Lab**	**Total**		
Year 2 Semester 1							
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
ML0004 Career Design & Workplace Readiness in the V.U.C.A World	ICC-CC	-	2	-	2	2	
CC0006 Sustainability: Society, Economy & Environment	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
Total						**22**	
Year 2 Semester 2							
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
CC0007 Science & Technology for Humanity	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						**23**	

Course Code and Title		**No. of hours per week**	**AUs**	

	Course Type	Lec	Tut	Lab	Total		Prerequisite / Remarks
Year 3 Semester 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)
MH3100 Real Analysis I	Core	3	1	-	4	4	MH1100 AND MH1101 or CY1601 or MH1802
MLXXXX Profession Preparation	ICC-PS					1	
MPE	MPE					3	
BDE	BDE					3	
Total						**14/17**	
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)

HW0218 Communication Across the Sciences						2	
MPE	MPE					3	
MPE	MPE					4	
BDE	BDE					3	
Total						**15/18**	

Course Code and Title	**Course Type**	**No. of hours per week**				**AUs**	**Prerequisite / Remarks**
		Lec	**Tut**	**Lab**	**Total**		
Year 4 Semester 1							
CM4081 Professional Internship	ICC-PS					10	CM3062
Total						**10**	
Year 4 Semester 2							
CM4080 Honours Project 1 (FYP)	Core					10	CM3061+CM3062 or by permission
MPE	MPE					3	
MPE	MPE					3	
Total						**16**	
Grand Total AU						**143**	