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

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 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		
CHEM	44	0	6	10	14	16	3	6	144
BS	30		15						

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 courses	AU
Chemistry Major (44AUs)	
CM1001 Foundations of Chemistry I	4
CM1002 Foundations of Chemistry II	4
MH1802 Calculus for the Sciences	4
CM1804 Mathematics for Chemistry	2
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
Biological Sciences Major (30AUs)	
BS1016 Physiology	3
BS1008 Biostatistics	3
BS1005 Biochemistry I	3
BS1006 Principles of Genetics	3
BS1007 Molecular and Cell Biology I	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
Total	**74**

Note:
^ CM3011, CM3021, CM3031, CM3041 are offered in Semesters 1 and 2

Students to take the following Major Prescribed Electives	AU
Chemistry Major: To read 6AUs	
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
Biological Sciences Major: To read 15AUs	
BS2010 Bioimaging	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
Total	**21**

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		4	
MH1802 Calculus for the Sciences	Core	3	1	-	4	4	
PS0001 Introduction to Computational Thinking	Core	-	1	2		3	
CC0001 Inquiry & Communication in an Interdisciplinary World	ICC-CC	-	2	-	2	2	
CC0015 Health & Wellbeing	ICC-CC	-	2	-	2	2	
BS1016 Physiology	Core	1	2	-	3	3	
BS1008 Biostatistics	Core	2	-	3		3	

HW0001 Introduction to Academic Communication	-					0	For students who fail QET
Total						**21**	
Year 1 Semester 2							
CM1804 Mathematics for Chemistry	Core	2	-	-	2	2	MH1802
CM1002 Foundations of Chemistry II	Core	3	-	3		4	
PS0002 Introduction to Data Science and Artificial Intelligence	ICC-PS	-	1	1		3	PS0001
CC0003 Ethics & Civics in a Multi-Cultural World	ICC-CC	-	2	-	2	2	
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	
BS1100 Molecular and Cell Biology Techniques Level 1	Core	-	1	6		3	
Total						**23**	

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	
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	CM1001 & CM1002
Total						**23**	
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	

BS2004 Molecular & Cell Biology II	Core	2	1	--		3	BS1007
Total						**18**	

Course Code and Title	Course Type	No. of hours per week				AUs	Prerequisite / Remarks
		Lec	Tut	Lab	Total		
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)
MLXXXX Profession Preparation	ICC-PS					1	
MPE	MPE					3	
MPE	MPE					3	
BDE	BDE					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)
HW0218 Communication Across the Sciences						2	
MPE	MPE					3	
MPE	MPE					3	
MPE	MPE					3	
Total						**14/17**	

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						**144**	