Double Major Bachelor of Science (Honours) Programme in Applied Physics and Chemistry

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 142 Academic Units (AUs):

- Major Requirements (103AUs)
- 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		
APHY	39	7	6	8	14	16	3	6	142
CHEM	37		6						

- Common Core: PS0001 and MH1802

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
PH4420 Professional Internship	10
Total	**33**

Students to take the following Major Core and Common Core courses	AU
Applied Physics Major (46AUs)	
PH1104 Mechanics	3
PH1105 Optics Vibrations and Waves	3
PH1199 Physics Lab 1b	2
PH1106 Electricity and Magnetism	3
PH1107 Relativity and Quantum Physics	3
PH2199 Physics Lab 2b	2
PH2103 Thermal Physics	4
PH2101 Quantum Mechanics I	3
PH2102 Electromagnetism	4
PH2301 Physical Optics	3
PH3199 Physics Laboratory IIIa	2
PH3101 Quantum Mechanics II	4
PH3103 Technological Applications of Quantum Mechanics	3
PS0001 Introduction to Computational Thinking	3
MH1802 Calculus for the Sciences	4
Chemistry Major (37AUs)	
CM1001 Foundations of Chemistry I	4
CM1002 Foundations of Chemistry II	4
CM1804 Mathematics for Chemistry	2
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	**83**

Students to take the following Major Prescribed Electives	AU
Applied Physics Major: To read 6AUs	
PH3301 Introduction to Bioimaging and Biosensing Techniques	3
PH3302 Non-Ionizing Medical Imaging and Processing	3
PH3401 Atomic Physics	4
PH3408 Signal and Noise in Biology	3
PH3602 Photonics	4
PH3603 Biophysics	3
PH4603 Soft Condensed Matter Physics	3
PH3605 Medical Physics for Radiotherapy	3
PH4607 Biomedical Imaging and Sensing	3
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
Total	**12**

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							
PH1104 Mechanics	Core	2	1	-	3	3	
PH1105 Optics, Vibrations and Waves	Core	2	1	-	3	3	
MH1802 Calculus for the Sciences	Core	3	1	-	4	4	Common Core
PS0001 Introduction to Computational Thinking	Core	-	1	2		3	Common Core
CC0001 Inquiry & Communication in an Interdisciplinary World	ICC-CC	-	2	-	2	2	
CC0015 Health & Wellbeing	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							
PH1106 Electricity and Magnetism	Core	2	1	-	3	3	
PH1107 Relativity and Quantum Physics	Core	2	1	-	3	3	
PH1199 Physics Lab 1b	Core	-	-	4	4	2	
PS0002 Introduction to Data Science and Artificial Intelligence	ICC-PS	2	1	1		3	
CC0003 Ethics & Civics in a Multicultural World	ICC-CC	-	2	-	2	2	
ML0004 Career Design & Workplace Readiness in the V.U.C.A World	ICC-CC	-	2	-	2	2	
CM1002 Foundations of Chemistry II	Core	3	-	3		4	
CM1804 Mathematics for Chemistry	Core	2	-	-	2	2	MH1802
Total						**21**	

Course Code and Title	**Course Type**	**No. of hours per week**				**AUs**	**Prerequisite / Remarks**
		Lec	**Tut**	**Lab**	**Total**		
Year 2 Semester 1							
PH2103 Thermal Physics	Core	3	1	-	4	4	PH1104 AND MH1803 or CY1308, CY1601 AND CY1602 or MH1101 AND MH1200
CC0006 Sustainability: Society, Economy & Environment	ICC-CC	-	3	-	3	3	
CCXXXX Care, Serve, Learn	ICC-CSL					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						**19**	
Year 2 Semester 2							
PH2199 Physics Lab 2b	Core	-	-	4	4	2	PH1199

PH2101 Quantum Mechanics I	Core					3	PH1107 AND MH1802 and CM1804
PH2301 Physical Optics	Core	2	1	-	3	3	PH1105
CC0007 Science & Technology for Humanity	ICC-CC	-	3	-	3	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						**20**	

Course Code and Title	**Course Type**	**No. of hours per week**				**AUs**	**Prerequisite / Remarks**
		Lec	**Tut**	**Lab**	**Total**		
Year 3 Semester 1							
PH2102 Electromagnetism	Core	2	2	-	4	4	PH1106, MH1802, AND (MH1803 or CM1804)
PH3101 Quantum Mechanics II	Core	3	1	-	4	4	PH2101 and (MH2801 or CM1804)
PH3103 Technological Applications of Quantum Mechanics	Core	2	1	-	3	3	PH2101
PH3199 Physics Laboratory IIIa	Core					2	
HW0218 Communication Across the Sciences	ICC-PS					2	
MLXXXX 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)

Total						**19/22**	
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	
MPE	MPE					3	
BDE	BDE					3	
Total						**18/21**	

Course Code and Title	**Course Type**	**No. of hours per week**				**AUs**	**Prerequisite / Remarks**
		Lec	**Tut**	**Lab**	**Total**		
Year 4 Semester 1							
PH4420 Professional Internship	ICC-PS					10	Complete Major Core
Total						**10**	
Year 4 Semester 2							
PH4XXX Final Year Project	Core					8	
MPE	MPE					3	
Total						**11**	
Grand Total AU						**142**	