Double Major Bachelor of Science (Honours) Programme in Applied Physics and Biological 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		
APHY	40	0	9	8	14	16	3	6	141
BS	36		9						

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 courses	AU
Applied Physics Major (40AUs)	
PH1104 Mechanics	3
PH1105 Optics, Vibrations and Waves	3
PH1199 Physics Lab 1b	2
MH1802 Calculus for the Sciences	4
PH1106 Electricity and Magnetism	3
PH1107 Relativity and Quantum Physics	3
MH1803 Calculus for Physics	4
PH2199 Physics Lab 2b	2
PH2103 Thermal Physics	4
PH2102 Electromagnetism	4
PH2301 Physical Optics	3
PH3199 Physics Laboratory IIIa	2
PS0001 Introduction to Computational Thinking	3
Biological Sciences (36AUs)	
BS1012 Foundations of Chemistry I	3
BS1013 Foundations of Chemistry II	3
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	**76**

Students to take the following Major Prescribed Electives	AU
Applied Physics Major: To read 9AUs	
PH3301 Introduction to Bioimaging and Biosensing Techniques	3
PH3302 Non-Ionizing Medical Imaging and Processing	3
PH3303 Biomechanics and Exercise Physiology	3
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
Biological Sciences Major: To read 9AUs	
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	23
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	**18**

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	
CC0001 Inquiry & Communication in an Interdisciplinary World	ICC-CC	-	2	-	2	2	
CC0015 Health & Wellbeing	ICC-CC	-	2	-	2	2	
BS1012 Foundations of Chemistry I	Core	3	1	3		3	
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						**23**	

Year 1 Semester 2							
PH1199 Physics Lab 1b	Core	-	-	4	4	2	
MH1803 Calculus for Physics	Core	2	2	-	4	4	MH1802
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	
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	
Total						**22**	

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
PS0001 Introduction to Computational Thinking	Core	-	1	2		3	
CC0006 Sustainability: Society, Economy & Environment	ICC-CC	-	3	-	3	3	
CCXXXX Care, Serve, Learn	ICC-CSL					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	BS1012 & BS1013
Total						**22**	
Year 2 Semester 2							
PH1106 Electricity and Magnetism	Core	2	1	-	3	3	
PH1107 Relativity and Quantum Physics	Core	2	1	-	3	3	
PH2199 Physics Lab 2b	Core	-	-	4	4	2	PH1199
PH2301 Physical Optics	Core	2	1	-	3	3	PH1105
PS0002 Introduction to Data Science and Artificial Intelligence	ICC-PS	2	1	1		3	PS0001

CC0007 Science & Technology for Humanity	ICC-CC	-	3	-	3	3	
BS1100 Molecular and Cell Biology Techniques Level 1	Core	-	1	6		3	
BS2004 Molecular & Cell Biology II	Core	2	1	-	3	3	BS1007
Total						**23**	

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)
PH3199 Physics Laboratory IIIa	Core					2	
HW0218 Communication Across the Sciences	ICC-PS					2	
MLXXXX Profession Preparation	ICC-PS					1	
MPE	MPE					3	
MPE	MPE					3	
Total						**15**	
Year 3 Semester 2							
MPE	MPE					3	
MPE	MPE					3	
MPE	MPE					3	
BDE	BDE					3	
BDE	BDE					3	
Total						**15**	

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						**141**	