

BIOLOGICAL SCIENCES WITH SECOND MAJOR IN BIOMEDICAL STRUCTURAL BIOLOGY

- First in Singapore to offer this unique programme in 2015, students will be cross-trained in biology and structural biology, including medicinal chemistry and biotechnological aspects
- Conducted in partnership with Lee Kong Chian School of Medicine, the Division of Chemistry and Biological Chemistry and School of Physical and Mathematical Sciences

ABOUT THE COURSE

Structural biology has gained importance in biomedical field, with increasing impact on healthcare and medicine. Areas such as structure-based discovery, structure-based vaccine design, structure-based design of biologics, structure-based design of novel biomaterials and structure-based design of protein engineering.

CAREERS

Graduates of this programme have enhanced working opportunities to work in pharmaceutical and biotechnology companies in the research and development in areas such as drug discovery, protein engineering, vaccine design.

WHAT YOU WILL LEARN

On top of the Biological Sciences course requirements, students will be required to learn:

- Basic Inorganic Chemistry with Laboratory
- Basic Organic Chemistry with Laboratory
- Basic Physical Chemistry with Laboratory
- Organic & Bioorganic Chemistry
- Physical and Biophysical Chemistry I
- Mathematics and Physics Topics for Structural Biologists
- NMR Spectroscopy and Applications to Drug Discovery
- Bioimaging Techniques in EM
- Structural Biology of RNA

Select 3 from the following:

- Natural Product Chemistry
- Advanced Bioorganic Chemistry
- Medicinal Chemistry
- Drug Design and Synthesis
- Molecular Modelling: Principle and Applications
- Macromolecular X-ray Crystallography with Laboratory
- Physiological Systems / Animal Models for Drug Development
- Current Topics in Cancer Drug Discovery
- Fragment Based Drug Discovery
- Spectroscopic Methods and Application

CURRICULUM STRUCTURE

B.Sc in Biological Sciences with Second Major in Biomedical Structural Biology

YEAR 1			AU
SEMESTER 1			
Core	BS1001	Introductory Biology	3
	BS1002	Biophysical Chemistry	3
	BS1003	Organic Chemistry	3
	BS1005	Biochemistry I	3
BSB-Core	CM1031	Basic Organic Chemistry with Laboratory	4
GER-Core	ML0001	Absolute Basics for Career*	1
GER-PE**	-	-	3
Total AUs			20

**Students will be pre-registered with GER-PE-LA 'HE9091 Principles of Economics' (3AUs) in their first semester. Students may drop the pre-registered GER-PE-LA and register for other available GER-PE.

SEMESTER 2			AU
Core	BS1006	Principles of Genetics	3
	BS1007	Molecular & Cell Biology I	3
	BS1008	Bioinformatics and Statistics	3
	BS1100	Molecular and Cell Biology Techniques Level 1	3
BSB-Core	CM1041	Basic Physical Chemistry with Laboratory	4
GER-Core	GC0001	Introduction to Sustainability: Multidisciplinary Approaches and Solutions*	1
GER-PE	-	-	3
Total AUs			20

YEAR 2			AU
SEMESTER 1			
Core	BS2001	Physiology	3
	BS2002	Microbiology	3
	BS2003	Biochemistry II	3
BSB-Core	BS2020	Mathematics and Physics Topics for Structural Biologists	3
	CM2031	Organic and Bioorganic Chemistry	3
GER-Core	HW0128	Scientific Communication I	2
GER-PE	-	-	3
Total AUs			20

SEMESTER 2			AU
Core	BS2008	Experimental Molecular & Cell Biology	3
BSB-Core	CM2041	Physical and Biophysical Chemistry I	3
	BS2021	RNA Structures & RNA Based Drug Development	3
Major PE	-	(See Table A)	9
GER-Core	HW0228	Scientific Communication II	2
	HY0001	Ethics and Moral Reasoning*	1
Total AUs			21

YEAR 3			AU
SEMESTER 1			
BSB-Core	BS3021	Bioimaging Techniques in EM	3
BSB-PE	-	(See Table D)	3
Major PE	-	(See Table B)	9
GER-Core	BS0001	Biology & Society	3
GER-Core	ML0002	Career Power Up!	1
Total AUs			19

YEAR 4			AU
SEMESTER 1			
Major PE	-	(See Table B)	12
BSB-PE	-	(See Table D)	3
GER-PE	-	-	3
Total AUs			18

SEMESTER 2

Major PE	BS4020 / BS4222	Final Year Project / Industrial Internship	12
Total AUs			12
<i>*Online courses</i>			
BSB-Core	BS3025	NMR Spectroscopy and Applications to Drug Discovery	3
BSB-PE	-	(See Table D)	3
Major PE	-	(See Table C)	12
GER-Core	ET0001	Entrepreneurship and Innovation*	1
Total AUs			19

TABLE A AUs

BS2004	Molecular and Cell Biology II	3
BS2007	Immunology	3
BS2009	Advanced Biochemistry	3
BS2010	Bioimaging	3
BS211S	Equations of Life	3
BS2012	Genetics and Genomics	3
BS2014	Microbial Biotechnology	3
BS3332 [^]	Undergraduate Advanced Experimental Biology (JAEB) Workshop (Series I) – Methods in Histology	3
BS3335 [^]	Undergraduate Advanced Experimental Biology (JAEB) Workshop (Series I) – Protein behavior in health and disease – Biophysical tools	3

TABLE B AUs

BS3001	Neurobiology	3
BS3003	Developmental biology	3
BS3004	Cancer biology	3
BS3005	Advanced molecular genetics	3
BS3018	Plant Biology	3
BS3020	Plant Biotechnology	3
BS3023	Regulatory Control of Healthcare Products and Medical Devices	3
BS3024 (TBC)	Human Evolution – from Genes to Health	3
BS3334 [^]	Undergraduate Advanced Experimental Biology (JAEB) Workshop (Series II) – DNA engineering for fluorescent in-situ hybridization (FISH)	3
BS3338 [^]	Undergraduate Advanced Experimental Biology (JAEB) Workshop (Series II) – Molecular mechanism of how anti-mitotic drugs work in cancer therapy	3
BS3342 [^] (TBC)	Undergraduate Advanced Experimental Biology (JAEB) Workshop Series II - Role of Actin cytoskeleton regulators in metastasis	3
BS3343 [^] (TBC)	Undergraduate Advanced Experimental Biology (JAEB) Workshop Series II-Genetics of Human Diseases	3
BS4001	Current topics in muscle biology and neuromuscular diseases	3
BS4004	Current topics in immunology	3
BS4006	Virology	3
BS4009	Biology of Aging	3
BS4010	Synthetic Biology	3

BS4011	Biology of Social Behavior	3
BS4014	Molecular Basis of Diseases	3
BS9001++	Research Experience	3
BS2103^^	TCM Diagnostics	6

TABLE C AUs

BS0002	Environmental Microbiology	3
BS3006	Bioentrepreneurship	3
BS3008	Computational Biology & Modelling	3
BS3010	Current topics in stem cell and developmental biology	3
BS3011	Protein folding and biomolecular NMR	3
BS3012	Functional Genomics and Proteomics	3
BS3013	Drug discovery and development, biotechnology	3
BS3014	Biological foundations of behavior	3
BS3015	The RNA World	3
BS3017	Advanced Microbial Pathogenesis	3
BS3019	Neuropsychology of Stress and Resilience	3
BS3022	Protein Trafficking	3
BS3331 [^]	Undergraduate Advanced Experimental Biology (JAEB) Workshop (Series I) – Applied Immunology	3
BS3336 [^]	Undergraduate Advanced Experimental Biology (JAEB) Workshop (Series I) – Proteomics Workshop	3
BS3339 [^]	Undergraduate Advanced Experimental Biology (JAEB) Workshop (Series I) – Neurobiology	3
BS3340 [^]	Undergraduate Advanced Experimental Biology (JAEB) Workshop (Series I) – Science of Aging and Life Extension in C. Elegans	3
BS3341 [^]	Undergraduate Advanced Experimental Biology (JAEB) Workshop (Series I) – Handling Stress and Resilience	3
BS1101^^	Basics of TCM	6

[^] Major PE which is conducted during the 1-week term break or during the 2 weeks before the term starts.

^^ BS1101 and BS2103 are considered as ONE Major PE.

TABLE D AUs Offering Sem

CM4034	Natural Product Chemistry and Drug Discovery	3	2
CM9082	Drug Design and Synthesis	3	2
BS3026	Fragment Based Drug Discovery	3	2
BS3027	Spectroscopic Methods and Application	3	2
BS3344	Undergraduate Advanced Experimental Biology (JAEB) Workshop (Series I) -Macromolecular X-ray Crystallography	3	2
CM4051	Advanced Bioorganic Chemistry	3	1
CM9081	Medicinal Chemistry	3	1
CM4043	Molecular Modelling: Principle and Applications	3	1
BS4012	Current Topics in Cancer Drug Discovery	3	1
BS4013	Physiological Systems: Animal Models for drug development	3	1

Note: BS4012 and BS4013 in Table D are allowed to be cleared as Major PE when all UE requirements are being fulfilled.

NTU reserves all rights to make changes to the programme structure with prior notice.