

**Requirements for Computational Biology Programme in the Faculty of Science
(For Students Matriculated in AY2009/10 and after)**

To be awarded a B.Sc. or B.Sc.(Hons.) with a major in Computational Biology, candidates must satisfy the following:

PROGRAMME REQUIREMENTS		MCs
University Requirements		
2 x General Education Modules	8	21 – 22
1 x Singapore Studies Module	4	
2 x Breadth Elective Modules ^[2]	9 – 10	
CS1101C or CS1101 or CS1101S Programming Methodology CS1102C or CS1102 or CS1102S Data Structures And Algorithms		
<u>Faculty Requirements</u>		16
CM1401 Chemistry for Life Sciences ^[1] LSM1101 Biochemistry Of Biomolecules ^[1] MA2213 Numerical Analysis 1 SP1201B Freshman Seminar ^[1]		
<u>Major Requirements</u>		36 - 40
Level-1000 / 2000 Essential ^[1]		
CS1231 Discrete Structures	4	
LSM1102 Molecular Genetics	4	
MA1101R Linear Algebra I	4	
MA1102R Calculus	4	
PC1432 Physics IIE	4	
CS2220 Introduction to Computational Biology ^[4]	4	
LSM2101 Metabolism And Regulation OR LSM2102 Molecular Biology OR LSM2103 Cell Biology	4	
LSM2201A Experimental Biochemistry OR LSM2202A Experimental Molecular And Cell Biology	4	
Either ST2334 Probability and Statistics OR a combined ST2131 Probability and ST2132 Mathematical Statistics*	4 - 8	
Level-3000 Essential		
MA3259 Mathematical Methods In Genomics	4	
LSM3231 Protein Structure and Function	4	
Level-3000 Electives ^[3] (Choose <u>Four</u> Modules) – [Either Any two modules from option A <u>and</u> any two modules from option B or option C OR Any two modules from option A <u>and</u> one module each from option B and option C]		16
<u>Option A</u>		

<p>CS2102 Database System CS3103 Computer Networks and Protocols CS3225 Combinatorial Methods in Bioinformatics CS3240 Human-Computer Interaction CS3241 Computer Graphics CS3243 Foundation of Artificial Intelligence CS3244 Machine Learning and Neural Networks</p> <p><u>Option B</u></p> <p>LSM3211 Fundamental Pharmacology LSM3213 Molecular and Cellular Neurobiology LSM3223 Immunology LSM3232 Microbiology LSM3233 Developmental Biology LSM3241 Bioinformatics & Biocomputing LSM3243 Molecular Biophysics LSM3244 Molecular Biotechnology PC3267 Biophysics II</p> <p><u>Option C</u></p> <p>MA3233 Algorithmic Graph Theory PR3203 Computer Aided Drug Design and Development ST3131 Regression Analysis ST3240 Multivariate Statistical Analysis ST3232 Design and analysis of experiments ST3233 Applied time series analysis ST3236/MA3238 Stochastic Process 1 ST3243 Statistical methods in epidemiology ST3245 Statistics in molecular biology</p>		
Level-4000 Essential		20
ZB4199 Honours Project in Computational Biology	12	
ZB4171 Advanced Topics in Bioinformatics	4	
LSM4241 Functional Genomics	4	
<p>Level-4000 Electives (Choose <u>THREE</u> Modules) – [Any two modules from either option A or option B or option C, and the remaining third module to be selected from the Option not chosen]</p> <p><u>Option A</u></p> <p>CS4220 Knowledge Discovery Methods in Bioinformatics CS4221 Database Design CS4231 Parallel and Distributed Algorithms CS4237 Systems Modelling and Simulations CS4243 Computer Vision and Pattern Recognition CS4244 Knowledge-Based Systems CS4248 Natural Language Processing</p> <p><u>Option B</u></p> <p>LSM4211 Toxicology</p>		12

LSM4212 Pharmacogenetics and Drug Response LSM4213 Systems Neurobiology LSM4221 Drug discovery and Clinical Trials LSM4222 Advanced Immunology LSM4224 Free Radicals and Antioxidant Biology LSM4231 Structural Biology LSM4232 Advanced Cell Biology LSM4242 Protein Engineering <u>Option C</u> MA4251/ST4238 Stochastic Processes II PC4267 Biophysics III ST4231 Computer intensive statistical methods ST4234 Bayesian Statistics ST4235 Simulation ST4240 Data Mining ST4241 Design & Analysis Of Clinical Trials ST4243 Statistical Methods for DNA Microarray Analysis	
Unrestricted Elective Modules ^[4]	26-31
TOTAL	160

^[1] Modules are part of the lower division requirements for the Computational Biology Programme.

^[2] Science students will read CS1101C Programming Methodology (4 MCs) and CS1102C Data Structures and Algorithms (5 MCs) in fulfilment of their Breadth Requirements.

^[3] ZB3288 UROPS in Computational Biology can be taken in fulfilment of 4MCs from any of the options in the level-3000 elective list.

^[4] Students may wish to read PC2267 Biophysics I as an unrestricted elective module to meet the prerequisites required for PC3267 Biophysics II (Level-3000 major elective module). Student without computing background may wish to read LSM2241 as a preparatory course before reading CS2220.

* Students should choose the combined ST2131 and ST2132 in place of ST2334 if they plan to pursue higher ST modules. ST2131 is a pre-requisite to ST2132.