

REGULATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN BIOINFORMATICS (BSc[BioInf])

(See also General Regulations and Regulations for First Degree Curricula)

BMS1 Admission to the Degree

To be eligible for admission to the degree of Bachelor of Science in Bioinformatics, candidates shall

- (a) comply with General Regulations;
 - (b) comply with the Regulations for First Degree Curricula; and
 - (c) satisfy all the requirements of the curriculum in accordance with the regulations that follow and the syllabuses of the degree.
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BMS2 Length of Study

The curriculum shall normally require six semesters of full-time study, spreading over three academic years.

BMS3 Completion of Curriculum

To complete the curriculum, candidates shall

- (a) satisfy the requirements prescribed in UG3 of the Regulations for First Degree Curricula and a further 3 credits of courses in English language enhancement.
 - (b) complete satisfactorily not less than 180 credits of courses, in the manner specified in the syllabuses, which shall include credits from all core courses in accordance with the syllabuses.
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BMS4 Selection of Courses

- (a) Candidates shall normally take not less than 24 and not more than 36 credits of courses in each semester, unless otherwise permitted or required by the Board of Studies.
 - (b) Candidates shall have to satisfactorily complete the prerequisite courses in order to enrol in succeeding courses, unless with exemption granted by the course coordinators of the courses concerned.
 - (c) Candidates with unsatisfactory academic progress may be required by the Board of Studies to take a reduced study load.
 - (d) Candidates shall select their courses in accordance with these regulations and the guidelines specified in the syllabuses before the beginning of each academic year.
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BMS5 Assessment and Grades

- (a) Candidates shall be assessed for each of the courses which they have registered for, and assessment may be conducted in any one or any combination of the following manners: written examinations or tests, continuous assessment, laboratory work, field work, project reports, or in any other manner as specified in the syllabuses.

- (b) Grades shall be awarded in accordance with UG5 of the Regulations for the First Degree Curricula.
 - (c) Written examinations shall normally be held at the end of each semester unless otherwise specified in the syllabuses.
 - (d) Candidates who fail in any core course may be required by the Board of Studies to repeat the same course in a subsequent semester, and/or to be re-assessed at a time and in a manner specified by the Board. The grades for all attempts made by a candidate will be recorded in his/her transcript.
 - (e) Candidates shall not be permitted to repeat a course for which they have received a grade D or above for upgrading purposes.
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BMS6 Discontinuation

A candidate will normally be recommended for discontinuation of his/her studies if

- (a) his/her semester GPA is unsatisfactory (<1.0) for any academic year; or
 - (b) he/she has failed in a core course three times; or
 - (c) he/she has passed less than 30 credits of courses for any academic year.
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BMS7 Absence from Examination

Candidates who are unable to be present at any examination of a course because of illness or other special circumstances may apply for permission to present themselves for examination at some other time. Any such application shall be made on the form prescribed within two weeks of the first day of the candidates' absence from any examination.

BMS8 Advanced Standing

- (a) Advanced standing in a course of study may be granted to candidates who have successfully completed a similar course at other universities or comparable institutions. The amount of advanced credits to be granted shall be determined by the Board of Studies, in accordance with the following principles:
 - (i) a minimum of two years of study at this University shall be required before the candidate is considered for the award of the degree; and
 - (ii) a minimum of 120 credits shall be gained in this University.
 - (b) Advanced credits granted to a candidate shall not be included in the calculation of his/her cumulative GPA.
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BMS9 Degree Classification

The degree of BSc (BioInf) shall be awarded in five divisions:

- (a) First Class Honours
- (b) Second Class Honours Division One
- (c) Second Class Honours Division Two
- (d) Third Class Honours
- (e) Pass

**SYLLABUS FOR THE DEGREE OF
BACHELOR OF SCIENCE IN BIOINFORMATICS**

	Course	Credits	Semester
Year 1			
BIOC1001	Basic Biochemistry	6	1
CSIS1117	Computer Programming I	6	1
CSIS1118	Mathematical Foundations of Computer Science	6	1
STAT1306 ¹	Introductory Statistics	6	1
ECEN1503	English for Computer Science	3	1
CBIO0001	Practical Chinese Language Course for BSc (BioInf) Students	3	1

BIOC1003	Introduction to Molecular Genetics	6	2
BIOC1805	Elements of Bioinformatics	6	2
CSIS1122	Computer Programming II	6	2
ECEN1504	Professional and Technical Communication for Computer Science	3	2
HSSELEC ²	Humanities and Social Sciences Studies Elective	3	2
ELEC	Elective subjects	6	2
Year 2			
BIOC2603	Principles of Molecular Genetics	6	1
BIOC2808	Bioinformatics Methods	6	1
CSIS1119	Introduction to Data Structures and Algorithms	6	1

BIOC2604	Essential Techniques in Biochemistry and Molecular Biology	6	2
CSIS0278	Introduction to Database Management Systems	6	2
CSIS0521	Concepts and Tools for Software Development	6	2
BIOC2811 ⁴	Structural Bioinformatics	6	2

ELEC ³	Elective subjects	12	1+2
GE&B	General Education and Broadening	6	1+2
Year 3			
BIOC3808 ⁴	Genomic Bioinformatics	6	2
CSIS0326	Computational Molecular Biology	6	1

BIOC3613	Molecular Biology of the Gene	6	2

BIOC3814	Bioinformatics Project	12	1+2
ELEC ³	Elective subject(s)	24	1+2
GE&B	General Education and Broadening	6	1+2

¹ STAT0301 may be taken with permission. Students wishing to pursue statistical genetics should take STAT1301 and STAT1302 in preference.

² HSSELEC may be taken at a different time.

³ Electives taken must include at least 6 credits of 2nd or 3rd year level Biochemistry courses.

⁴ Year 3 students in 2007-8 must take BIOC2811 and not BIOC3808.

Core Course Descriptions

BIOC1001 Basic Biochemistry (6 credits)

The course is designed to present an overview of biochemistry and to provide an understanding of the basic mechanisms underlying life processes. This is an independent course which can be taken by students from various disciplines. It also prepares students for further studies in Biochemistry and Molecular Biology.

Prerequisite: AS Biology or AS Chemistry

BIOC1003 Introduction to Molecular Genetics (6 credits)

The objectives of this course are to provide students with basic and up-to-date knowledge on the structure and functions of nucleic acids, to give students a general picture of the molecular process of gene expression, and to introduce students to recombinant DNA technology.

Prerequisite: AS Biology or AS Chemistry

CSIS1117 Computer Programming I (6 credits)

The goal of this course is for students to learn the general principles of programming, including how to design, implement, document, test, and debug programs.

Prerequisite: Nil

CSIS1118 Mathematical Foundations of Computer Science (6 credits)

Logic, sets, and functions; mathematical reasoning; counting techniques; relations; graphs; trees; modelling computation.

Prerequisite: Nil

CSIS1119 Introduction to Data Structures and Algorithms (6 credits)

Arrays, linked lists, trees and graphs; stacks and queues; symbol tables; priority queues, balanced trees; sorting algorithms; complexity analysis.

Prerequisite: CSIS1117 or ELEC1501

Co-requisite: CSIS1122

CSIS1122 Computer Programming II (6 credits)

This is the second programming course following the CSIS1117. The goal of this course is to strengthen students' programming skills, in particular, on implementing basic data structures and algorithms. Students will also learn various tools for developing programs in the UNIX/Linux environment.

Prerequisite: CSIS1117 or ELEC1501

STAT1306 Introductory Statistics (6 credits)

Presentation of data, Variability and Uncertainty, Measures of Central Tendency, Measures of Dispersion, Basic Probability Theory and Techniques, Random Variables and Probability Distributions, Random Samples, Point Estimation, Normal Sampling Theorem, Confidence Intervals, Hypotheses Testing, Simple Linear Regression and Correlation.

Prerequisite: A-level Pure Mathematics or AS-level Mathematics & Statistics or equivalent.

BIOC1805 Elements of Bioinformatics (6 credits)

To introduce the main concepts, software and databases used in Bioinformatics. Students will learn the PERL scripting language to implement basic bioinformatics tasks.

Prerequisite: CSIS1117 or ELEC1501

Co-requisite: BIOC1003 or equivalent

ECEN1503 English for Computer Science (3 credits)

The course is designed to enable 1st year computer science majors to acquire technical communication skills. The focus is on developing students' understanding and use of language in spoken and written communication. Topics include: how to participate effectively in discussions with a focus on asking, responding to questions and negotiating meaning; making appropriate grammatical and lexical choices; conducting effective oral presentations; writing effectively with a focus on content, form and language. Students engage in both individual and group work to conduct oral discussions and oral presentations, and write proposals.

Prerequisite: Nil

ECEN1504 Professional and Technical communication for Computer Science (3 credits)

The course is designed to enable computer science majors to acquire professional and technical communication skills. The focus is on understanding and using professional and technical language. Topics include: producing and asking questions to elicit information; conducting effective interviews; organising and analysing information; writing effective technical reports with a focus on coherence and cohesion; and increasing technical vocabulary. Students are required to design and conduct authentic oral interviews and, produce written technical reports and vocabulary journals.

Prerequisite: ECEN1503

CBIO0001 Practical Chinese Language Course for BSc (BioInf) Students (3 credits)

This course aims to sharpen student's skills in practical Chinese writing and oral presentation. It considers the fundamentals of modern Chinese language, simplified Chinese characters, traditional Chinese characters, office documents, target-oriented writings for Bioinformatics professionals as well as the techniques of presentation and communication.

Prerequisite: Nil

BIOC2603 Principles of Molecular Genetics (6 credits)

To provide basic knowledge on molecular genetics, illustrating modern concepts with current experimental approaches and computer-assisted programmes.

Prerequisites: BIOC1001 or BIOC1003 or BIOL1102 or BIOL1122 or BIOL1125 or BIOL1106

BIOC2604 Essential Techniques in Biochemistry and Molecular Biology (6 credits)

To give students a general overview of different experimental approaches and model systems, and to provide students with hands-on experience in basic biochemical and molecular techniques.

Prerequisites: BIOC1001 or BIOC1003 or BIOL1102 or BIOL1122 or BIOL1125 or BIOL1106

BIOC2808 Bioinformatics Methods (6 credits)

This course will focus on the methods and algorithms for DNA and protein sequence analysis, database searching, structural bioinformatics and phylogenetic analysis. Some knowledge of programming and algorithms is assumed.

Prerequisites: BIOC1003, BIOC1805, CSIS1117 and CSIS1119 or equivalent.

BIOC2811 Structural Bioinformatics (6 credits)

To introduce the bioinformatic study of protein structure and the proteome. This will cover the principles of protein structure, protein classification and identification, the structure determination and modelling of proteins and protein-protein interactions.

Prerequisites: BIOC1001, BIOC1003, BIOC2808

BIOC3808 Genomic Bioinformatics (6 credits)

To present bioinformatics topics applicable to genomic biology and the “post-genome” phase of molecular biology.

Prerequisite: BIOC2808

CSIS0278 Introduction to Database Management Systems (6 credits)

This course studies the principles, design, administration, and implementation of database management systems. Topics include: entity-relationship model, relational model, relational algebra and calculus, database design and normalisation, database query languages, indexing schemes, integrity, concurrency control, and query processing.

Prerequisite: CSIS1119 or ELEC1501

CSIS0521 Concepts and Tools for Software Development (6 credits)

This course will introduce the following concepts and techniques for software development: key steps in a software development life cycle; software development methodologies; components of a web-based software tools; installation of servers (e.g. web server, database server etc.); web programming (e.g. PHP, MySQL); key issues in human-user interface; data visualization (e.g. visualization on the web with SVG). Examples will be drawn from practical cases such as bioinformatics software tools development. The emphasis is on how to formulate the computational problem based on the user requirements and the related practical concerns for the development of the software.

Prerequisite: CSIS1117

BIOC3613 Molecular Biology of the Gene (6 credits)

To provide an up-to-date knowledge of molecular biology, especially with respect to the regulation of eukaryotic gene expression, molecular embryology.

Prerequisite: BIOC2603 or BIOL2303 or BIOL3308

CSIS0326 Computational Molecular Biology (6 credits)

The novel and specialised algorithms needed to solve computational problems related to the vast amounts of data generated by modern molecular biology techniques will be examined in detail.

Prerequisites: Either CSIS0250 or BIOC2808

BIOC3814 Bioinformatics Project (12 credits)

Students will be required to take a bioinformatics project which demands substantial work under the supervision of a teacher.

General Education and Broadening

General Education and Broadening electives taken may not include subjects offered by the Faculties of Science and Engineering.

Other Elective Courses

Elective courses may be taken from any courses, from any faculty, for which the student is qualified. Students are suggested to consider taking more subjects in either Biochemistry and/or Computer Science. For descriptions of Biochemistry courses please see the listings under the BSc syllabuses of the Faculty of Science. For Computer Science courses please see listings under the BEng(CS) syllabuses of the Faculty of Engineering.

In particular students are highly recommended to take BIOC2601 “Metabolism”, BIOC3609 “Molecular Medicine”, and BIOC3615 “Advanced Techniques in Biochemistry and Molecular Biology”. Students should note that one Biochemistry subject, in addition to those specified in the syllabus above, must be taken.

From Computer Science, students are very highly recommended to take CSIS0396 “Object-oriented Programming and JAVA”. Courses with more direct utility for Bioinformatics are CSIS0250 “Design and Analysis of Algorithms” and CSIS0270 “Artificial Intelligence”. Students wishing to take broader options in computer science should take CSIS1120 “Machine Organisation and Assembly Language Programming”.