

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

(See also General Regulations)

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			
BIOC1801	Basic Biochemistry	6	1
CSIS1117	Computer Programming	6	1
CSIS1501	Foundations of Biocomputing	6	1
ELEC	One elective	6	1

BIOC1803	Introduction to Molecular Genetics	6	2
BIOC1805	Elements of Bioinformatics	3	2
CSIS1119	Introduction to Data Structures and Algorithms	6	2
CSIS1120	Machine Organisation and Assembly Language Programming	6	2
CMED1002	Introduction to Statistics	3	2

	General Education and Broadening	12	1+2
Year 2			
BIOC2803	Principles of Molecular Genetics	6	1
CSIS0278	Introduction to Database Management Systems	6	1
BIOC2808	Basic Bioinformatics	6	1
BIOC2816	Molecular Evolution	3	1
CMED2002	Introduction to Epidemiology and Clinical Trials	3	1

BIOC2811	Functional Proteomics	6	2
BIOC2809	Molecular Medicine	6	2
CSIS0396	Programming Methodology and Object-Oriented Programming	6	2
ELEC	One elective	6	2

	General Education and Broadening	12	1+2
Year 3			
CSIS0322	Internet and the World Wide Web	6	1
ELEC	Two Electives	12	1
Project <i>or</i>	Bioinformatics, Biochemistry or Computing Project	12	1+2
ELEC	Elective	6	1

BIOC3813	Molecular Biology of the Gene	6	2
CSIS0326	Introduction to Computational Molecular Biology	6	2
BIOC3808	Advanced Bioinformatics (genomics and gene expression)	6	2
Project <i>or</i>	Bioinformatics, Biochemistry or Computing Project (<i>cont.</i>)	12	1+2
ELEC	Elective	6	2

	General Education and Broadening	12	1+2

Core Course Descriptions

BIOC1801 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 Nil

BIOC1803 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 control of gene expressions, and to introduce students to the implications of molecular genetics in the development of recombinant DNA technology.

Prerequisite Nil

CSIS1117 Computer Programming (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

CSIS1501 Foundations of biocomputing (6 credits)

Basic elements of discrete mathematics and computation; combinatorics, probability, and biostatistics; mathematical and computational problems in bioinformatics; representation of biological data.

Prerequisite Nil

CSIS1119 Introduction to Data Structures (6 credits)

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

Prerequisite CSIS1117

CSIS1120 Machine Organisation and Assembly Language Programming (6 credits)

Fundamentals of computer organisation and machine architecture; number, character and instruction representations; addressing modes; assembly language programming including stack manipulation and subroutine linkage; basic logic design and integrated devices; the central processing unit and its control; concepts of microprogramming, data flow and control flow; I/O devices and their controllers, interrupts and memory organisation; computer arithmetic.

Prerequisite Nil

CMED1002 Introduction to Statistics (3 credits)

To provide the basic statistical background for students.

Prerequisite Nil

BIOC1805 Elements of Bioinformatics (3 credits)

To introduce the main concepts, software and databases used in Bioinformatics.

Prerequisite Nil

Co-requisite BIOC1803 or equivalent

BIOC2803 Principles of Molecular Genetics (6 credits)

To provide basic knowledge on molecular genetics, illustrating modern concepts with current experimental approaches and computer-assisted programmes. Together with subjects taken in the third year, a comprehensive background is provided for advanced study and/or research in molecular biology.

Prerequisite BIOC1801 and BIOC1803

BIOC2811 Functional Proteomics (6 credits)

To introduce the study of the “Proteome” the proteins encoded by the genome. This will cover the principles of protein structure, protein classification, prediction and modeling of proteins, and protein-protein interactions. Experimental methods for structure determination and identifying protein-protein interactions (yeast two-hybrid, 2D-gels/mass spectrometry, protein chips, surface plasmon resonance) will be discussed as well as the related computational approaches.

Prerequisites BIOC1801; BIOC1803

BIOC2809 Molecular Medicine (6 credits)

To provide up-to-date knowledge of the genetic and molecular basis of human diseases in preparation for a career in medical molecular biology or pathology, biotechnological, pharmaceutical and biochemical industries; genome research.

Prerequisite BIOC2803

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, security, integrity, concurrency control, and contemporary topics in database management systems.

Prerequisites CSIS1117 and CSIS1119

CSIS0396 Programming Methodology and Object-Oriented Programming (6 credits)

Abstract data types and classes; object-oriented programming; program development, generation and analysis tools; scripting and command languages; user interfaces and GUIs; program documentation.

Prerequisite CSIS1117

BIOC2808 Basic Bioinformatics (6 credits)

This course will focus on the methods and algorithms for DNA and protein sequence analysis, the main bioinformatics databases available, and will introduce some of the major sequence analysis packages available. Topics covered will include sequence alignment, database searching, pattern recognition and predictive methods. Some knowledge of programming and algorithms is assumed.

Prerequisites BIOC1803; CSIS1117 and CSIS1119 or equivalent.

BIOC2816 Molecular Evolution (3 credits)

The basic techniques and methods to study evolution at the molecular level will be presented. Models of molecular evolution, the measurement of genetic distance, and methods of tree construction and validation will be discussed.

Prerequisites BIOC1803

CMED2002 Introduction to Epidemiology and Clinical Trials (3 credits)

The principles and methodology underlying epidemiology and clinical trials will be discussed.

Prerequisite CMED1002 or equivalent.

BIOC3813 Molecular Biology of the Gene (6 credits)

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

Prerequisite BIOC2803

CSIS0322 Internet and the World Wide Web (6 credits)

Introduction and history; networks, internetworking, and network protocols; TCP/IP and related protocols; client-server model and programming; distributed applications; Domain Name System; Internet applications: TELNET, mail, FTP, etc.; Internet security; intranet and extranet; virtual private networks; World Wide Web; Web addressing; HTTP; HTML, XML, style sheets, etc.; programming the Web: CGI, Java, JavaScript, etc.; Web servers; Web security; Web searching; push technology; other topics of current interest.

Prerequisite Nil

CSIS0326 Introduction to Computational Molecular Biology (6 credits)

To provide an in depth understanding of the algorithms used in computational molecular biology.

Prerequisites CSIS1117 and CSIS1119 and CSIS0250 or equivalent

BIOC3808 Advanced Bioinformatics (6 credits)

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

Prerequisite BIOC2808

Elective Courses

Elective courses may be taken from any of the suggested electives given below or from other courses, offered by the Medical or Science Faculties or the Department of Computer Science and Information Systems or the Department of Statistics and Actuarial Science, for which the student is qualified.

<i>Suggested Electives</i>	<i>Credits</i>	<i>Semester</i>
CSIS1127 Introduction to Information Systems	6	1
BIOC2601 Metabolism	6	1
BIOC2604 Essential Techniques in Biochemistry and Molecular Biology	6	2
BIOC2605 Understanding Cancer	6	1
BIOC2602 Understanding Metabolic Diseases	6	2
CSIS0270 Artificial Intelligence	6	2
CSIS0271 Computer Graphics	6	1
CSIS0250 Design and Analysis of Algorithms	6	1
CSIS0259 Principles of Programming Languages	6	1
BIOC3610 Advanced Biochemistry I	6	1
BIOC3611 Advanced Biochemistry II	6	2
BIOC3612 Biochemistry Seminar	6	1
CSIS0323 Advanced Database Systems	6	1
PAED3001 Genetics in Child Health	3	1
BIOC3614 Biochemistry Project	12	1+2
BIOC3814 Bioinformatics Project	12	1+2
CSIS0801 Year Project	12	1+2

CSIS1127 Introduction to Information Systems (6 credits)

Fundamental principles of Management Information Systems are covered. Topics include: organisational and technical foundations of Information Systems (IS); survey of computer-based IS; management of IS resources; IS requirements analysis and design; database management; telecommunications; end user computing. Special emphasis is paid to the Internet as a foundation for new business models and processes.

BIOC2601 Metabolism (6 credits)

This course aims to provide the basic concepts of metabolism: the events and the importance in relation to the survival of living organisms.

Prerequisite BIOC1801

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.

Prerequisite BIOC1801

BIOC2605 Understanding Cancer (6 credits)

To demonstrate to the students how current research in molecular biology and biochemistry has improved tremendously our knowledge on the genesis of cancer, and how such newly acquired knowledge forms the basis of new strategies for combating against the disease.

Prerequisite BIOC1801

Co-requisite BIOC2803

BIOC2602 Understanding Metabolic Diseases (6 credits)

To widen and deepen knowledge and understanding of metabolism. By using a problem-based learning (PBL) approach, students are trained in critical thinking and problem-solving skills. Students will be able to grasp the major effects on metabolic integration and control and they can use these concepts with greater confidence and success in approaching new problems and new areas of study.

Prerequisite BIOC1801, BIOC2601

CSIS0270 Artificial Intelligence (6 credits)

AI programming languages; logic; theorem proving; searching; problem solving.

Prerequisite CSIS1119

CSIS0271 Computer Graphics (6 credits)

Overview of graphics hardware; basic drawing algorithms; 2-D transformations; windowing and clipping; interactive input devices; curves and surfaces; 3-D transformations and viewing; hidden-surface and hidden-line removal; shading and colour models; modelling; illumination models; image synthesis; computer animation.

Prerequisite CSIS1119

CSIS0250 Design and Analysis of Algorithms (6 credits)

The course studies various algorithms design techniques, such as divide and conquer, and dynamic programming. These techniques are applied to design highly non-trivial algorithms from various areas of computer science. Topics include: advanced data structures; graph algorithms; searching algorithms; geometric algorithms; overview of NP-complete problems.

Prerequisite CSIS1117 and CSIS1119

CSIS0259 Principles of Programming Languages (6 credits)

Syntax and semantics specification; data types; data control and memory management; expressions, precedence and associativity of operators; control structures; comparative study of existing programming languages; advanced topics such as polymorphism, programming paradigms, exception handling and concurrency.

Prerequisite CSIS1118, CSIS1119 and CSIS1120

BIOC3610 Advanced Biochemistry I (6 Credits)

Molecular and cellular signal transduction mechanisms and information transfer. Metabolic regulation by various post-translational mechanisms.

Prerequisites BIOC1001, BIOL2301 and BIOC2601 or BIOL2115

BIOC3611 Advanced Biochemistry II (6 Credits)

General principles that govern macromolecular structure and interactions. Physical and chemical techniques for determining the static and dynamic structures of macromolecules. Advanced protein chemistry. Advanced enzymology with initial rate kinetics and catalytic mechanisms.

Prerequisite BIOC3610

BIOC3612 Biochemistry Seminar (6 credits)

To strengthen the student's capacity to critically assess, think, write and talk about issues in molecular life sciences. The course employs active learning in small groups; students will be guided to optimise their performance in teamwork and their communication skills.

Prerequisites BIOC1801 and BIOC2803; preferably taken in the 3rd year

CSIS0323 Advanced Database Systems (6 Credits)

The course will study some advanced topics and techniques in database systems, with a focus on the system and algorithmic aspects. It will also survey the recent development and progress in selected areas. Topics include: overview of data mining; the KDD process and system architecture; example applications; DSS, data warehouse, data cube, and OLAP; mining binary association rules; mining association rules with quantitative attributes; mining sequential patterns; decision tree classifiers; neural network classifier; cluster analysis; text mining; web mining.

Prerequisite CSIS0278

PAED3001 Genetics in Child Health (3 credits)

To relate genetics with childhood diseases of local relevance and health care.

Prerequisite Nil

BIOC3614 Biochemistry Project (12 credits)

To enable students to acquire the basic skills in scientific research: literature search, critical reasoning, communication, teamwork and time management. This may not be taken with BIOC3814, CSIS0801 or CSIS0802.

Prerequisite Good overall performance in second year-courses. To be taken in the third year.

BIOC3814 Bioinformatics Project (12 credits)

Students will be required to take a bioinformatics project which demands substantial work under the supervision of a teacher. This may not be taken with BIOC3614, CSIS0801 or CSIS0802.

Prerequisite Good overall performance in second year-courses. To be taken in the third year.

CSIS0801 Year Project (12 credits)

Students will be required to take a computing project which demands substantial work under the supervision of a teacher. This may not be taken with BIOC3614, BIOC3814 or CSIS0802.