BIOMEDICAL COMPUTING – SPECIALIZATION (COMPUTING) – BACHELOR OF COMPUTING (HONOURS)

BMCO-P-BCH (Biomedical Computing)
BMCO-I-BCH (Biomedical Computing with Professional Internship)

Subject: Administered by the School of Computing in cooperation with the Departments of Biology, Chemistry, and Biomedical and Molecular Sciences.
Plan: Consists of 102.00 units as described below.
Program: The Plan, with sufficient electives to total 120.00 units, will lead to a Bachelor of Computing (Honours) Degree.

Note: Requirements for this program have been modified. Please consult the 2022-2023 (https://www.queensu.ca/academic-calendar/archive/2022-2023/arts-science/)*Calendar* for the previous requirements.

Code	Title	Units
1. Core		
A. Complete the following:		
CISC 121	Introduction to Computing Science I	3.00
CISC 124	Introduction to Computing Science II	3.00
B. Complete the following:		
BIOL 102	Fundamentals of Biology: Molecular and Cell Biology	3.00
BIOL 103	Fundamentals of Biology: Organisms to Ecosystems	3.00
C. Complete the following:		
CHEM 112	General Chemistry	6.00
D. Complete 6.00 units from the following:		**6.00**
CISC 102 & MATH 112	Discrete Mathematics for Computing I and Introduction to Linear Algebra	
CISC 102 & MATH 111	Discrete Mathematics for Computing I and Linear Algebra	
MATH 110	Linear Algebra	
E. Complete 6.00 units from the following:		**6.00**
MATH 120	Differential and Integral Calculus	
MATH 121	Differential and Integral Calculus	
MATH 123 & MATH 124	Differential and Integral Calculus I and Differential and Integral Calculus II	
F. Complete 3.00 units from the following:		**3.00**
STAT 263	Introduction to Statistics	
STAT 268	Statistics and Probability I	
STAT 351	Probability I	
STAT_Options		
G. Complete the following:		
CISC 203	Discrete Mathematics for Computing II	3.00
CISC 204	Logic for Computing Science	3.00
CISC 221	Computer Architecture	3.00
CISC 223	Software Specifications	3.00
CISC 235	Data Structures	3.00
CISC 271	Linear Data Analysis	3.00
H. Complete the following:		
BIOL 205	Mendelian and Molecular Genetics	3.00
I. Complete the following:		
BCHM 218	Molecular Biology	3.00
J. Complete the following:		
CISC 330	Computer-Integrated Surgery	3.00
CISC 352	Artificial Intelligence	3.00
CISC 360	Programming Paradigms	3.00
CISC 365	Algorithms I	3.00
K. Complete 3.00 units from the following:		**3.00**
BCHM 315	Proteins and Enzymes	
BIOL 334	Comparative Biochemistry	
L. Complete the following:		
BIOL 331	Analytical Genomics	3.00
M. Complete 9.00 units from the following:		**9.00**
CISC 320	Fundamentals of Software Development	
CISC 332	Database Management Systems	
CISC 471	Computational Biology	
CISC 472	Medical Informatics	
N. Complete the following:		
CISC 497	Social, Ethical and Legal Issues in Computing	3.00
O. Complete 3.00 units from the following:		**3.00**
CISC 495	Software Evolution	
CISC 499	Advanced Undergraduate Project	
CISC 500	Undergraduate Thesis	
2. Option		
A. Complete 12.00 units from the following course list		**12.00**
BMCO_Options		
Electives		

Elective Courses	18.00
Total Units	**120.00**

3. Substitutions

A. Students in the internship version of this Plan will substitute 3.00 units from COMP at the 300-level for requirement 1.O. (CISC 499 (https://www.queensu.ca/academic-calendar/search/?P=CISC%20499)). In addition, the B.Cmp.(Hons.) Program requirements will be increased by 6.00 units from COMP at the 300-level, for a total of 126.00 units if the student is taking a 12-month internship, or by 9.00 units from COMP at the 300-level, for a total of 129.00 units if the student is taking a 16-month internship.

4. Notes

A. Students with no programming experience should review the Introductory Courses (https://www.queensu.ca/academic-calendar/arts-science/schools-departments-programs/computing/) paragraph included on the School of Computing overview page in the *Calendar*.

B. ELEC courses are offered by the Faculty of Engineering and Applied Science. Special permission may be required to register. All such courses will count as 3.00 units towards degree requirements in Arts and Sciences.

C. With the approval of the Undergraduate Chair, students who take CISC 500 working on a project directly related to Biomedical Computing may count 3.00 units towards BMCO_Options.

D. A maximum of 6.00 units from courses offered by other Faculties and Schools may be counted toward the program and/or Plan requirements. This includes courses in BMED, COMM, GLPH, HSCI, LAW, NURS, and courses in the Faculty of Engineering and Applied Science.

Biomedical Computing Course List

The following list contains courses offered through other Departments. In accordance with Academic Regulation **2.6** (Access to Classes), students do not have enrolment priority in all of these courses. Access to these courses may only be made available during the Open Enrolment period, and then only if space permits.

BMCO_Options

Code	Title	Units
Options in the Biomedical Computing Plan		
CHEM 281	General Organic Chemistry I (with Virtual Laboratory)	3.00
CHEM 282	General Organic Chemistry II	3.00
CHEM 285	General Organic Chemistry II (with Virtual Laboratory)	3.00
PHGY 215	Principles of Mammalian Physiology I	3.00
PHGY 216	Principles of Mammalian Physiology II	3.00

(ANAT; BIOL; BCHM; CANC; CISC; CISC_Subs; CRSS; DDHT; EPID; LISC; MBIO; MICR; PATH; PHAR; PHGY) at the 300-level or above

CISC_Subs

Code	Title	Units
Courses in other departments usable as CISC Options		
COMM 365		
ELEC 470	Computer System Architecture	3.00
MATH 272	Applications of Numerical Methods	3.00
MATH 337	Stochastic Models in Operations Research	3.00
MATH 401	Graph Theory	3.00
MATH 402	Enumerative Combinatorics	3.00
MATH 434	Optimization Theory with Applications to Machine Learning	3.00
MATH 474	Information Theory	3.00

STAT_Options

Code	Title	Units
Statistic Course Options		
BIOL 243	Introduction to Statistics	3.00
CHEE 209	Analysis Of Process Data	3.00
COMM 162	Managerial Statistics	3.00
ECON 250	Introduction to Statistics	3.00
GPHY 247	Introduction to Statistics	3.00
KNPE 251	Introduction to Statistics	3.00
NURS 323	Introduction to Statistics	3.00
POLS 285	Introduction to Statistics	3.00
PSYC 202	Statistics in Psychology	3.00
SOCY 211	Introduction to Statistics	3.00
STAM 200	Introduction to Statistics	3.00
STAT 263	Introduction to Statistics	3.00