# COMPUTING, MATHEMATICS AND ANALYTICS – SPECIALIZATION (COMPUTING) – BACHELOR OF COMPUTING (HONOURS)

**COMA-P-BCH** (Computing, Mathematics and Analytics)
**COMA-I-BCH** (Computing, Mathematics and Analytics with Professional Internship)

**Subject:** Administered by the School of Computing and the Department of Mathematics and Statistics.
**Plan:** Consists of 84.00 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** | | |
| – COMPUTING – | | |
| **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:** | | |
| 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 |
| **C. Complete 3.00 units from the following:** | | **3.00** |
| CISC 322 | Software Architecture | |
| CISC 326 | Game Architecture | |
| **D. Complete the following:** | | |
| CISC 324 | Operating Systems | 3.00 |
| CISC 360 | Programming Paradigms | 3.00 |
| CISC 365 | Algorithms I | 3.00 |
| **E. Complete the following:** | | |
| CISC 497 | Social, Ethical and Legal Issues in Computing | 3.00 |
| **F. Complete 3.00 units from the following:** | | **3.00** |
| CISC 495 | Software Evolution | |
| CISC 499 | Advanced Undergraduate Project | |
| CISC 500 | Undergraduate Thesis | |
| – MATHEMATICS AND STATISTICS – | | |
| **G. Complete 6.00 units from the following:** | | **6.00** |
| MATH 110 | Linear Algebra | |
| CISC 102 & MATH 111 | Discrete Mathematics for Computing I and Linear Algebra | |
| **H. Complete 6.00 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 | |
| **I. Complete 6.00 units from the following:** | | **6.00** |
| MATH 210 | Rings and Fields | |
| MATH 211 | Algebraic Methods | |
| MATH 310 | Group Theory | |
| MATH 311 | Elementary Number Theory | |
| MATH 413 | Introduction to Algebraic Geometry | |
| MATH 414 | Introduction to Galois Theory | |
| **J. Complete 3.00 units from the following:** | | **3.00** |
| MATH 221 | Vector Calculus | |
| MATH 280 | Advanced Calculus | |
| **K. Complete the following:** | | |
| STAT 269 | Statistics and Probability II | 3.00 |
| STAT 361 | Applied Methods in Statistics I | 3.00 |
| STAT 463 | Fundamentals of Statistical Inference | 3.00 |
| **L. Complete 3.00 units from following:** | | **3.00** |
| STAT 252 | Introductory Applied Probability | |
| STAT 268 | Statistics and Probability I | |
| STAT 351 | Probability I | |
| **2. Option** | | |
| **A. Complete 12.00 units from the following course list** | | **12.00** |
| COMA_Options | | |
| **Electives** | | |
| Elective Courses | | 36.00 |
| **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.F.** (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. Students should select some of their option courses to be focused in a particular area; the following is a list of suggested areas:

i. Communications and
Coding: MATH 401; MATH 406; MATH 418; MATH 474; MATH 477.

ii. Data Analysis: CISC 271; CISC 371; CISC 372; CISC 473; STAT 361; STAT 456; STAT 457; STAT 462; STAT 463; STAT 464; STAT 471; STAT 473; STAT 486.

iii. Theory in Computer Science: CISC 422; CISC 462; CISC 465; CISC 467; MATH 401; MATH 402; MATH 418.

iv. Discrete Math and
Optimization: MATH 337; MATH 401; MATH 402.

C. Students may seek approval for a modified selection of courses for COMA_Options; a written rationale is required.

D. Students interested in pursuing graduate studies in mathematics should take additional mathematics courses.

E. Some CISC, MATH, STAT, and BIOM option courses are offered only in alternate years. The courses to be offered each year are announced on the departmental websites before the course selection period, and students should refer to that information in planning their course selections.

F. With the approval of the Undergraduate Chair, students who take CISC 500 working on a project directly related to Computing, Mathematics, or Analytics may count 3.00 units towards COMA_Options.

G. 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.

## Computing and Mathematics 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.

## COMA_Options

| Code | Title | Units |
|------|-------|-------|
| **Courses in other departments usable as COMA options** | | |
| BIOM 300 | Modeling Techniques in Biology | 3.00 |
| CISC 271 | Linear Data Analysis | 3.00 |
| CISC 330 | Computer-Integrated Surgery | 3.00 |
| CISC 371 | Nonlinear Data Analysis | 3.00 |
| CISC 372 | Advanced Data Analytics | 3.00 |
| CISC 422 | Formal Methods in Software Engineering | 3.00 |
| CISC 455 | Evolutionary Optimization and Learning | 3.00 |
| CISC 457 | Image Processing and Computer | 3.00 |
| CISC 462 | Computability and Complexity | 3.00 |
| CISC 465 | Semantics of Programming Languages | 3.00 |
| CISC 467 | Fuzzy Logic | 3.00 |
| CISC 472 | Medical Informatics | 3.00 |
| CISC 473 | Deep Learning | 3.00 |
| CISC 500 | Undergraduate Thesis | 6.00 |
| MATH 337 | Stochastic Models in Operations Research | 3.00 |
| MATH 339 | Evolutionary Game Theory | 3.00 |
| MATH 401 | Graph Theory | 3.00 |
| MATH 402 | Enumerative Combinatorics | 3.00 |
| MATH 406 | Introduction to Coding Theory | 3.00 |
| MATH 413 | Introduction to Algebraic Geometry | 3.00 |
| MATH 414 | Introduction to Galois Theory | 3.00 |
| MATH 418 | Number Theory and Cryptography | 3.00 |
| MATH 474 | Information Theory | 3.00 |
| MATH 477 | Data Compression and Source Coding: Theory and Algorithms | 3.00 |
| STAT 361 | Applied Methods in Statistics I | 3.00 |
| STAT 456 | Bayesian Analysis | 3.00 |
| STAT 457 | Statistical Learning II | 3.00 |
| STAT 462 | Statistical Learning I | 3.00 |
| STAT 463 | Fundamentals of Statistical Inference | 3.00 |
| STAT 464 | Discrete Time Series Analysis | 3.00 |
| STAT 471 | Sampling and Experimental Design | 3.00 |
| STAT 473 | Generalized Linear Models | 3.00 |
| STAT 486 | Survival Analysis | 3.00 |