BIOLOGY - QUANTITATIVE BIOLOGY MAJOR (B.SC.) (73 CREDITS)

Offered by: Biology (Faculty of Science)
Degree: Bachelor of Science
Program credit weight: 73

Program Description

Interdisciplinary research that draws from the natural and physical sciences is an important aspect of modern biology. The Quantitative Biology option is designed for students with a deep interest in biology who wish to gain a strong grounding in physical sciences and their application to biological questions. The program has two options: an ecology and evolutionary biology stream, and a physical biology stream. Both streams provide a balance of theory and experimental components.

Students may complete this program with a minimum of 68 credits or a maximum of 73 credits depending on whether MATH 222 Calculus 3. and CHEM 212 Introductory Organic Chemistry 1. are completed.

Advising Notes for U0 Students

It is highly recommended that freshman BIOL, CHEM, MATH, and PHYS courses be selected with the Program Adviser to ensure they meet the core requirements of the Quantitative Biology option.

This program is recommended for U1 students achieving a CGPA of 3.20 or better; and entering CEGEP students with a Math/Science R-score of 28.0 or better.

Degree Requirements — B.Sc.
This program is offered as part of a Bachelor of Science (B.Sc.) degree.

To graduate, students must satisfy both their program requirements and their degree requirements.

- The program requirements (i.e., the specific courses that make up this program) are listed under the Course Tab (above).
- The degree requirements—including the mandatory Foundation program, appropriate degree structure, and any additional components—are outlined on the Degree Requirements page.

Students are responsible for ensuring that this program fits within the overall structure of their degree and that all degree requirements are met. Consult the Degree Planning Guide on the SOUSA website for additional guidance.

Note: For information about Fall 2025 and Winter 2026 course offerings, please check back on May 8, 2025. Until then, the "Terms offered" field will appear blank for most courses while the class schedule is being finalized.

Required Courses (43 credits)
Bio-Physical Sciences Core (31 credits)

Expand allContract all

Course	Title	Credits
BIOL 219	Introduction to Physical Molecular and Cell Biology.	4
BIOL 301	Cell and Molecular Laboratory.	4
BIOL 395	Quantitative Biology Seminar.	1
CHEM 212	Introductory Organic Chemistry 1.[1]	4
COMP 202	Foundations of Programming.[2]	3
MATH 222	Calculus 3.[1]	3
MATH 223	Linear Algebra.	3
MATH 315	Ordinary Differential Equations.	3
MATH 323	Probability.	3
MATH 324	Statistics.	3

[1] Students who have taken the equivalent of CHEM 212 Introductory Organic Chemistry 1. or MATH 222 Calculus 3. can make up the credits with a complementary 3 or 4 credit course in consultation with a stream adviser.

[2] Students who have sufficient knowledge of programming should take COMP 250 Introduction to Computer Science. rather than COMP 202 Foundations of Programming..

Biology (6 credits)
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Course	Title	Credits
BIOL 202	Basic Genetics.	3
BIOL 215	Introduction to Ecology and Evolution.	3

Physics (6 credits)
Expand allContract all

Course	Title	Credits
PHYS 230	Dynamics of Simple Systems.	3
PHYS 232	Heat and Waves.	3

Course Requirements for Quantitative Biology Streams (21 credits)

21 credits from one of the following two streams:

Stream 1: Theoretical Ecology and Evolutionary Biology (21 credits)
Biology
Expand allContract all

Course	Title	Credits
BIOL 205	Functional Biology of Plants and Animals.	3
BIOL 206	Methods in Biology.	3
BIOL 304	Evolution.	3
BIOL 308	Ecological Dynamics.	3

Field Courses
3 credits from the following list or any other field course with permission:

Expand allContract all

Course	Title	Credits
BIOL 240	Monteregian Flora.	3
BIOL 331	Ecology/Behaviour Field Course.	3
BIOL 432	Limnology.	3

6 credits chosen from the following list of courses at the 400 level or above:

Expand allContract all

Course	Title	Credits
BIOL 432	Limnology.	3
BIOL 434	Theoretical Ecology.	3
BIOL 435	Natural Selection.	3
BIOL 465	Conservation Biology.	3
BIOL 509	Methods in Molecular Ecology.	3
BIOL 510	Advances in Community Ecology.	3
BIOL 515	Advances in Aquatic Ecology.	3
BIOL 540	Ecology of Species Invasions.	3
BIOL 594	Advanced Evolutionary Ecology.	3
BIOL 596	Advanced Experimental Design. [1]	1
BIOL 597	Advanced Biostatistics. [1]	2
BIOL 598	Advanced Design and Statistics. [1]	3

[1]   Students choose either both BIOL 596 Advanced Experimental Design. and BIOL 597 Advanced Biostatistics., or BIOL 598 Advanced Design and Statistics..

Stream 2: Physical Biology (21 credits)

Expand allContract all

Course	Title	Credits
BIOL 319	Introduction to Biophysics.	3
PHYS 329	Statistical Physics with Biophysical Applications.	3
PHYS 346	Majors Quantum Physics.	3

300-level complementary courses: 6 credits from the following:

Expand allContract all

Course	Title	Credits
BIOL 300	Molecular Biology of the Gene.	3
BIOL 303	Developmental Biology.	3
BIOL 306	Neural Basis of Behaviour.	3
BIOL 309	Mathematical Models in Biology.	3
BIOL 313	Eukaryotic Cell Biology.	3

500-level complementary courses: 6 credits from the following:

Expand allContract all

Course	Title	Credits
BIOL 518	Advanced Topics in Cell Biology.	3
BIOL 520	Gene Activity in Development.	3
BIOL 524	Topics in Molecular Biology.	3

Course	Title	Credits
BIOL 530	Advances in Neuroethology.	3
BIOL 551	Principles of Cellular Control.	3
BIOL 588	Advances in Molecular/Cellular Neurobiology.	3

Complementary Courses
Quantitative Biology - Theoretical Ecology and Evolutionary Biology, and Physical Biology Streams

9 credits from the following:

Recommendations for either Theoretical Ecology and Evolutionary Biology or Physical Biology streams

Expand allContract all

Course	Title	Credits
BIOL 466	Independent Research Project 1.	3
COMP 206	Introduction to Software Systems.	3
COMP 250	Introduction to Computer Science.	3
COMP 251	Algorithms and Data Structures. [1]	3
COMP 350	Numerical Computing.	3
COMP 364	Computer Tools for Life Sciences.	3
MATH 235	Algebra 1. [2]	3
MATH 240	Discrete Structures. [2]	3
MATH 314	Advanced Calculus.	3
MATH 317	Numerical Analysis. [1]	3
MATH 319	Partial Differential Equations .	3
MATH 326	Nonlinear Dynamics and Chaos.	3
MATH 327	Matrix Numerical Analysis.	3
MATH 348	Euclidean Geometry.	3
MATH 437	Mathematical Methods in Biology.	3
MATH 447	Introduction to Stochastic Processes.	3

[1]   Students may take COMP 350 Numerical Computing. OR MATH 317 Numerical Analysis..
[2]   MATH 235 Algebra 1. or MATH 240 Discrete Structures. are required for COMP 251 Algorithms and Data Structures..

Recommendations for Physical Biology stream

Expand allContract all

Course	Title	Credits
BIEN 310	Introduction to Biomolecular Engineering.	3
BIEN 320	Molecular, Cellular and Tissue Biomechanics.	3
BIEN 340	Transport Phenomena in Biological Systems 2.	3
BIEN 510	Engineered Nanomaterials for Biomedical Applications.	3
BIEN 530	Imaging and Bioanalytical Instrumentation.	3
CHEM 222	Introductory Organic Chemistry 2.	4
PHYS 242	Electricity and Magnetism. [1]	2
PHYS 257	Experimental Methods 1.	3
PHYS 342	Majors Electromagnetic Waves.	3

PHYS 434	Optics.	3
PHYS 519	Advanced Biophysics.	3
PHYS 534	Nanoscience and Nanotechnology.	3

[1]   PHYS 242 Electricity and Magnetism. is required for PHYS 342 Majors Electromagnetic Waves. and PHYS 434 Optics..

Recommendations for Theoretical Ecology and Evolutionary Biology stream

Expand allContract all

Course	Title	Credits
BIOL 310	Biodiversity and Ecosystems.	3
BIOL 324	Ecological Genetics.	3
MATH 242	Analysis 1.	3
MATH 340	Discrete Mathematics.	3
MATH 423	Applied Regression.	3
MATH 524	Nonparametric Statistics.	4
MATH 525	Sampling Theory and Applications.	4
PHYS 329	Statistical Physics with Biophysical Applications.	3