

Multidisciplinary Programs and University Wide Courses

I. BACHELOR OF COMMERCE AND SCIENCE - B.C.S.

Bishop's University offers an interdisciplinary degree program leading to a Bachelor of Commerce and Science, B.C.S. The program provides students with a broad-based, modern education. Students simultaneously pursue studies in two streams: one scientific discipline, and the other in commerce. They develop skills in scientific analysis, effective presentation, and quantitative reasoning while receiving training in the languages of international commerce and advanced science. The result is a rigorous education in two different yet complimentary fields of human activity. Providing exactly such broad, liberal, education of outstanding quality is the mission of Bishop's University.

The B.C.S. degree program, with its small classes, individual instruction, intimate learning environment and mentoring professors, produces graduates who confidently take up careers in environmental consulting, in the biotechnology and biopharmaceuticals industries, as entrepreneurs, technology managers and marketers, personal training and fitness providers, financial advisors, science journalists and writers. B.C.S. grads may also pursue graduate studies in schools of business, applied science, environmental law, journalism, or health fields.

The Program

Students are considered for admission into the B.C.S. degree program after completion of a Québec Collegial Diploma (DEC— Diplôme Etudes Collegial), grade 12 in other provinces or the U.S.A., or the equivalent level of education from other international origins. Admitted students (except those possessing a DEC from a Québec CEGEP) will normally be registered in 123-credit programs. The program is normally of four years duration, or 120 course credits, plus the 3- credit, English Writing Proficiency examination (EWP) which all Bishop's students must complete. See the section for *Four-Year Students* below. Applicants with a DEC may be admitted to a B.C.S. degree program of three years duration (93 credits including the EWP). See the section for *CEGEP Applicants* below. Three-year students are exempt from the "foundations studies" courses with which four-year students begin their B.C.S. degree at Bishop's.

All students admitted to the B.C.S. program choose one concentration stream of studies from among the sciences or mathematics, and simultaneously pursue broad-based studies in commerce from the Williams School of Business. All B.C.S. students must also complete a set of cognate courses, designed to provide skills important across both fields of his/her concentration studies, and give opportunity for reflection and discussion of relevant societal issues. In addition, all 3-year students have one free elective course choice, while all 4-year students have three or four free-elective choices, depending on the science or math concentration stream chosen.

Three-year students immediately begin the required courses listed in sections A. – C. below. Four-year students must first complete the required "foundations studies" courses which are all prerequisite to the courses composing the various concentration streams in section A. below. Therefore, four-year students normally begin the courses listed in sections A. – C. in their second year of studies at Bishop's. See the section for *Four-Year Students* below for further details.

A. Concentration Streams in Science and Mathematics

All B.C.S. students (3-year and 4-year) must choose one "concentration stream" from List A. The lists of required courses and options for each of these streams are found in the section, *Course Lists for Science and Math Concentration Streams*, further below.

LIST A

(Total: at least 36 credits or 12 lecture courses, plus labs)

Applied Mathematics Exercise Science and Sports Studies
Biochemistry Physics
Chemistry Physiology
Computer Science Psychology
Environmental Biology Pure Mathematics

B. Commerce Core and Business Electives

All B.C.S. students (3-year and 4-year) must complete the following “Commerce Core” plus any six Business courses (18 credits of “Business required electives”).

COMMERCE CORE

(Total: 19 credits — 6 courses plus 1 lab)

BAC 121 Purposes of Accounting
BMG 112 -Introduction to Management Theory and Practice
plus ILT 100 Information Literacy and Critical Thinking Laboratory
BMK 112 Consumer Behaviour and Introduction to Marketing
BFN 201 Finance I
BHR 221 Organizational Behaviour
BMK 211 Marketing Management

BUSINESS REQUIRED ELECTIVES

(Total: 18 credits — 6 courses)

A student may choose to fill the “Business required electives” with 6 courses chosen from one of the “Concentration Streams” available from the Williams School of Business, namely:

Accounting Human Resource Management
Entrepreneurship International Business
Finance Marketing

In this case, the student’s transcript will include a notation for the Business concentration stream selected. Alternately, the student may choose any six courses from the Williams School of Business (other than the commerce core).

C. Cognate Component

All B.C.S. students (3-year and 4-year) must complete 15-credits – 5 courses of “Cognate courses” as listed in parts a) – c).below. In addition, all 4-year students (only) must also complete the writing course listed in part d):

- a) 6-credits of Economics: ECO 102 and ECO 103
- b) 6-credits of Statistics: PHY 101 and BMA 141
 - Students whose science concentration is “Psychology” may take PMA 160 and PMA 161 instead of PHY 101 and BMA 141
 - Students whose science concentration is “Exercise Science and Sports Studies” may replace Phy 101 with BMA 140.
- c) 3-credits of “Reflective Studies”. Students choose one of the following:
 - i) PHI 245 The Philosophy of Science,
 - ii) SCI 201 History of Science,
 - iii) PHI 240 Topics in Business Ethics
 - iv) BPH 240 Business and Professional Ethics,

- v) BIO 252 Bioethics,
 - vi) CSC 201 Computer Ethics,
 - vii) PSY 330 Psychology and Ethics
- d) 3-credits of "Writing Skills" training. All 3-year students are exempt from this cognate requirement. All 4-year students must complete:
ELA 116 Effective Writing
- Note: this course may be taken in the first year of a 4-year program.

D. Free Electives

All 3-year B.C.S. students must complete one, 3-credit free elective course of their choosing. All 4-year students must complete 9-12 credits (3 or 4 courses) of free electives, depending on their choice of science or mathematics concentration stream. See the section for 4-year students below.

Recommended free electives include those in the list for the "reflective studies" cognate requirement (not including the one chosen to fulfill the requirement), and:

BMG 214 -Introduction to Entrepreneurship:
New Venture Creation.

E. English Writing Proficiency (EWP)

Before graduating, all Bishop's students must complete the 3-credit EWP exam. Normally this is completed during the first year of studies.

Applicants from a Québec CEGEP

Students with a DEC in Pure and Applied Sciences or in Health Sciences from a Québec CEGEP will be admitted to a 3-year program of 93 credits including the English Writing Proficiency test (EWP). However, students with any Québec diploma of collegial studies (DEC) will be considered for admission to the B.C.S. degree program. Other CEGEP graduates will be admitted to programs of varying lengths depending on the concentration stream chosen, and which (if any) collegial science, psychology and mathematics courses the student has been credited with in their DEC program. Any CEGEP graduate who is missing some (or all) of the "foundations" courses appropriate to their choice of science or math concentration stream from List A, above, will have these courses added to the total credit requirements for their degree, necessarily making their programs longer than 3-years. The appropriate "foundations" courses are found in Table I, in the section for Four-Year Students, below. Usually, a DEC in Sciences will have covered these "foundations" courses. That is, if a student's DEC included some or all of the collegial courses: General Biology, General Chemistry, Solutions Chemistry, Differential Calculus, Integral Calculus, Linear Algebra, Introduction to Psychology, Mechanics, Electricity and Magnetism, the equivalent "foundations" courses will not be required.

The first year of a 3-year program is called the U1 year. Students admitted to the 3-year program will normally register in the U1 year in ten, one-semester courses plus all co-requisite laboratories as follows:

6 credits of economics: ECO 102 and ECO 103

6 credits of statistics: PHY 101 and BMA 141

9 credits in their chosen science or math concentration plus any co-requisite laboratories (as per the lists below)

9 credits of commerce core: BAC 121, BMG 112 (+ ILT 100), BMK 112

The 3-year (93-credit) program is composed of 36 lecture credits in the student's chosen science or mathematics concentration (plus any co-requisite laboratories), the 18-credit "Commerce Core", 18 additional credits of Business required electives, 6 credits of Economics, 6 credits of Statistics, 3 credits of reflective studies (chosen from a list of approved courses), and 3 free credits (one free elective course), plus the 3-credit EWP.

Four-Year Students

First Year: Foundations Studies

All Students admitted to a 4-year B.C.S. program will normally register in first year in ten, one-semester courses, plus all co-requisite laboratories. This first year of studies is called the U0 year. Students will register in six or seven “foundations” science and mathematics courses (2 mathematics, and 4 or 5 science courses all as per Table I below), plus ELA 116 Effective Writing, and two or three elective courses. The number and nature of the required foundations science and math courses depends on which science or mathematics concentration stream is chosen. Students may choose to replace one or more of the free electives in U0 with a required cognate course in economics and/or a required course from the “Commerce Core”. While not necessary, these choices will result in increased scheduling flexibility in the student’s upper years, at which time the free elective courses would be chosen. The 2nd year in a 4-year program is called the U1 year.

All 4-year B.C.S. students must include the following in their U0-year:

6-9 credits of Mathematics as per table I below.

9-15 credits of Sciences plus any co-requisite laboratories, as per table I below.

3-credits: ELA 116 Effective Writing, as per table I below

Either 6-9 credits of free electives as per table I below or

One of BAC 121, BMG 112 (plus ILT 100) or BMK 112, plus one of ECO 102 or ECO 103, plus (possibly) one free elective course

TABLE I

	Biochemistry, Environmental Bio, or Physiology	Chemistry or
Physics Exercise Science & Sports Studies	Pure or Applied	Mathematics or Computer
	Science Psychology	
MAT 198, MAT 199	MAT 191, 192	MAT 198, MAT 199
BIO 191, BCH 191	BIO 191, BCH 191	MAT 191, 192
CHE 191, CHE 192	CHE 191, 192	MAT 193, 195
PHY 193	PHY 191, 192	MAT 108
	PSY 101 or PSY 102	BIO191, BCH 191
ELA 116	ELA 116	CSC 101
2 free electives	3 free electives	PHY 191, PHY 192
		PSY 101, PSY 102
		ELA 116
		ELA 116
		3 free electives

NOTES

1. A course in Precalculus Mathematics, MAT 190, is available, if necessary.
2. All 4-year students normally complete 3–6 credits (1–2 courses) of free electives during the U0 year and a further 3 credits (1 course) during the upper years.
3. All of the courses in Table I have 1 credit, co-requisite laboratories except BCH 191, ELA 116, MAT 191, 192, 198, 199, PSY 101 and 102. The laboratory for CSC 101 is integrated into the 4-credit course.
4. Recommended free electives include:
 - a. any of the courses in the approved list for the “reflective studies” cognate (not counting the one taken to fulfill the cognate requirement C.c) above).
 - b. the entrepreneurship course (if it is not already being counted as one of the Business required electives for requirement B. above):
 - BMG 214 -Introduction to Entrepreneurship:
 - New Venture Creation.

Course Lists for Science and Math Concentration Streams

NOTES

1. The course lists below describe 36-credit (12 course) concentration streams in science or mathematics, beginning with the U1-year. In all cases it is assumed that all appropriate U0 “Foundations” science and math courses (or their collegial equivalents for cegep graduates) as outlined in Table I above have already been completed.
2. Some science courses have 1-credit, co-requisite laboratories. These credits do not count toward the degree’s total credit requirements, but are necessary for the degree.
3. Course numbers with an “a” are offered only in the fall semester. Course numbers with a “b” are offered only in the winter semester; others are scheduled as needed.

Applied Mathematics

MAT 105a Introduction to Discrete Mathematics
MAT 106a Advanced Calculus I
MAT 107b Advanced Calculus II
CSC 111 Programming Methodology
MAT 210a Ordinary Differential Equations
MAT 211b Mathematical Methods of Physics
MAT 213a Introduction to Probability
MAT 214b Introduction to Mathematical Statistics
MAT 217b Complex Analysis
MAT 224 Cryptography
MAT 225 Numerical Methods
MAT 301 Vector Analysis

Biochemistry

BIO 110a Introductory Cellular and Molecular Biology
BIO 118b Genetics + Lab
CHE 102 Inorganic Chemistry I
CHE 104 Analytical Chemistry –
An Environmental Approach + Lab
CHE 105a Organic Chemistry I – Introductory + Lab
CHE 106b Organic Chemistry II – Introductory + Lab
BCH 211a Biochemistry I – Proteins + Lab
BCH 212b Biochemistry II – Lipids and Biomembranes + Lab
BIO 226a Animal Physiology I + Lab
BCH 275b Biochemistry III – Metabolism + Lab
BIO 352 Microbiology + Lab
BCH 370 Molecular Genetics

Chemistry

CHE 102 Inorganic Chemistry I and CHE 189
(a stand alone lab)
CHE 103 Physical Chemistry I + Lab
CHE 104 Analytical Chemistry –
An Environmental Approach + Lab
CHE 105 Organic Chemistry I – Introductory + Lab
CHE 106 Organic Chemistry II – Introductory + Lab

CHE 144 Environmental Chemistry I –
Energy and the Atmosphere
CHE 221 Elements and Minerals + Lab
CHE 222 Inorganic Chemistry III + Lab
CHE 223 Physical Chemistry II + Lab
CHE 224 Physical Chemistry III + Lab
CHE 225 Intermediate Organic Chemistry I + Lab
CHE 227 Principles and Practices of Chemical Spectroscopy and Mass Spectrometry + Lab

Computer Science

MAT 105a Introduction to Discrete Mathematics
CSC 111 Programming Methodology
CSC 121 Advanced Programming Techniques
CSC 204 Data Structures
CSC 207 Using and Designing Databases
CSC 215 Data Communications
CSC 217 Design and Analysis of Algorithms
CSC 218 Advanced C++ Programming
CSC 303 Principles of Programming Languages
CSC 309 Principles of Operating Systems
CSC 310 Software Engineering
+ 1 Computer Science elective course

Environmental Biology

BIO 115 a Diversity of Life I + Lab
BIO 116b Diversity of Life II + Lab
BIO 117a Ecology + Lab
BIO 118b Genetics + Lab
CHE 144 Environmental Chemistry I –
Energy & the Atmosphere + Lab
BIO 212b Evolution

+ 6 courses from the list below..

*BIO 113 Field Biology I
*BIO 114 Field Biology II
ESG 127 Intro to Physical Geography
BIO 217 Advanced Ecology
BIO 221 Biogeography
BIO 230 Freshwater Biology
BIO 257 Vascular Plants Systematics
BIO 270 Vertebrate Zoology
BIO 330 Ornithology
BIO 349 Biology of the Insects
BIO 358 Animal Behaviour

* these courses are only offered during the Spring/summer semesters.

Exercise Science & Sports Studies

EXS 101 Introduction to Exercise Science
EXS 127b Introductory Exercise Physiology
EXS317a Biomechanics + Lab
EXS 373 Advanced Exercise Science + Lab
(cross-listed as BIO 333)
PSY 102 Introductory Psychology II: Human Interactions

BIO 133 Human Anatomy + Lab
One of: PSY 203a Sport and Psychology: Performance Enhancement
or PSY 204b The Social Psychology of Sport and Exercise
PBI 227a Psychology of Nutrition
PBI 275 Health Psychology I
PBI 276 Health Psychology II
PBI 288b Brain and Behavior I

One of: SOC 155 Sociology of Sports,
SPO 201 Culture and Society,
SPO 301 Athletes and Society, or
SPO 401 Experiential Learning*

* ELP 300 Experiential Learning Placement, may replace this course,
upon approval.

Physics

MAT 106a Advanced Calculus I
MAT 107b Advanced Calculus II
MAT 108a Matrix Algebra
PHY 106 Waves and Optics
PHY 107 Thermal and Fluid Physics
PHY 117 Introduction to Mechanics
PHY 213a Modern Physics I
PHY 214b Modern Physics II
+ 4 Physics courses from the 200 level

Physiology

CHE 105a Organic Chemistry I – Introductory + Lab
BIO 110a Introductory Cellular and Molecular Biology
BIO 115a Diversity of Life I + Lab
BIO 116b Diversity of Life II + Lab
BIO 118b Genetics + Lab
BIO 133 Human Anatomy + Lab
BIO 215 Metabolism + Lab
BIO 226a Animal Physiology I + Lab
BIO 228b Animal Physiology II + Lab

+ 3 courses from the list below:

BIO 278 Physiology and Pharmacology of Aging
BIO 310 Advanced Cell Biology
BIO 314 Biotechnology + Lab
BIO 320 Programd Cell Death
BIO 328 Advanced Physiology
BIO 352 Microbiology + Lab
BIO 359 Human Genetics
BIO 360 Molecular Genetics
BIO 365 Developmental Biology

Psychology

PSY 206 Personality I
PSY 207 Personality II
PSY 213 Research Methods

PBI 288 Brain and Behaviour I

PSY 342 History of Psychology

One of: PSY 245 or

PSY 246 (Social Psychology I or II)

One of: PSY 219 Psychology of Women,

PSY 293 Multicultural Psychology, or

PBI 241 Evolutionary Psychology

One of: PCS 305 Cognition,

PSY 329 Applied Memory and Cognition, or PSY 370 Learning and Memory

One of: PSY 236 Child Development I

PSY 237 Child Development II),

PSY 266 Adult Development and Aging, or PSY 290 Adolescence

+3 courses from any area of Psychology.

Note: some courses have pre-requisite requirements which must be met.

Pure Mathematics

MAT 104 History of Mathematics

MAT 105a Introduction to Discrete Mathematics

MAT 109b Linear Algebra

MAT 115b Further Discrete Mathematics

MAT 125 Number Theory

MAT 215a Real Analysis I

MAT 216b Real Analysis II

MAT 217 Complex Analysis

MAT 221 Introduction to Modern Algebra I

MAT 222 Introduction to Modern Algebra II

MAT 331 Metric Spaces and Topology

+ 1 Mathematics course from the 200 or 300 level

GENERAL NOTES:

1. Students in the B.C.S. program are encouraged to seek regular academic advising from the faculty member elected for this responsibility, and from the Department Chairperson in charge of the science or mathematics concentration stream chosen.
2. Students may flexibly change their programs according to the normal Divisional and Departmental regulations appropriate. They may apply to pursue a major or honours specialization in Science or Mathematics leading to the B.Sc. or B.A. degree, or apply to pursue a B.B.A. (Bachelor of Business Administration) or B.A. Major Business degree in the Williams School of Business.
3. **Double Failure Rule:** Any student who twice receives a failing grade in any course required in either the Commerce Core, the required Business electives, or the science or mathematics concentration stream chosen for their B.C.S degree, will not be permitted to repeat that course again, and are also precluded from receiving transfer credit for the equivalent course elsewhere. Such students will not be eligible to graduate with a B.C.S. degree, but may be eligible to switch programs as in note 2).
4. **Maintenance of Good Standing:** Notwithstanding the University regulations on Academic Standing, the B.C.S. degree program has additional requirements. Students with cumulative averages of 60% or more, calculated at the end of each academic semester, remain in good standing in the B.C.S. degree program. For the purposes of this regulation, the cumulative average will be computed for the first time after the student has registered in two full-time academic semesters at Bishop's or has attempted thirty credits. In the case that a course is repeated, the grade awarded on the second attempt will be the only one used in the computation of the average. Students will not be permitted to remain

registered in the B.C.S. degree program if their cumulative average is less than 50%. Students with cumulative averages between 50 and 59% will be permitted to remain in the program for one additional semester during which they must improve their cumulative average to greater than 60% or they will not be permitted to remain in the B.C.S. program. Having been required to leave the B.C.S. program, a student is not eligible to transfer back in.

5. The University reserves the right to add or delete or modify these program regulations at its convenience. For graduation purposes, a student may meet the requirements of the program as in force during the academic year in which he/she entered the program, or as in force during the academic year of graduation, whichever is more advantageous to the student.

Program Contact:

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Division of Natural Sciences and Mathematics:

T.B.A.

SCI 201ab History of Science 3-3-0

This course provides an introduction to the history of science. It briefly outlines the development of thinking about the natural world from the ancient myths and philosophies of the Middle East and Greece to the time of Galileo. It then follows the shift from the medieval to the modern view of man's place in the universe that took place between Copernicus and Newton and its intellectual, religious and social implications. It discusses the historical development of the modern scientific endeavor including the models of Descartes, Boyle, and Newton, Darwin and the theory of evolution, electromagnetism and Maxwell's equations. The course concludes with an emphasis on some of the most modern developments: mathematical models, the age of technology, materials, computation, genetics and DNA, biotechnology, proteomics, nanotechnology and quantum physics.

EXS 101a Introduction to Exercise Science 3-3-0

This course provides an introduction to the field of exercise science as a discipline and profession. Using epidemiological studies, students are exposed to the role of physical activity on morbidity and mortality. Primary and secondary health-risk factors are examined relative to the influence physical activity has on them and one's quality of life. Causes of sports injury are also addressed.

Co-requisite: Exercise Science 181a.

EXS 181a Introductory Exercise Science Laboratory 1-0-3

The laboratory course focuses on practical knowledge of human body movement. Biomechanical concepts and principles are applied to understand movement in running, jumping, throwing, kicking, and swimming.

Co-requisite: Exercise Science 101a.

EXS 127b Introductory Exercise Physiology 3-3-0

This course explores concepts in Exercise Physiology, with applications in Sports Medicine. The student will be challenged to apply basic knowledge of human anatomy and physiology to exercise, training and sports. Adaptation of body systems to exercise, injury and reconditioning will be studied. Basic principles of biomechanics and exercise will be explored. The course will consist of lectures, presentations, discussion periods, and demonstrations.

Prerequisites: Secondary school Biology and/or Chemistry are recommended.

BIO 133a Human Anatomy 3-3-0

The anatomy of all of the major body systems will be discussed in the context of human health and disease. This course is designed for students interested in the biomedical sciences or health education. Students will develop their understanding of human anatomy and will acquire the ability to communicate scientific concepts to their patients or students.

Prerequisite or Co-requisite: Biology 191 or collegial Biology

Co-requisite: Biology Laboratory 133

Professor Hull

BIL 133a Human Anatomy Lab 1-0-3

This laboratory course gives students a solid grounding in vertebrate anatomy through dissections and preserved material. Dissection material will include either in part or whole, several mammalian species including sheep, cat, cow, and pig. Material will focus on the recognition and development of the major organs and systems such as the skeletal, muscle, nervous, reproductive, excretory, and digestive systems. Although general mammalian structure will be examined, the relevance of these structures to human anatomy will represent the major focus of the course.

Prerequisite or Co-requisite: Biology 191 or collegial Biology.

Co-requisite: Biology 133

Professor Richardson

EXS 317a Biomechanics of Human Movement 3-3-0

This course provides an introduction to Kinesiology and the biomechanics of human movement, particularly the kinematics and kinetics of the musculoskeletal system. Qualitative evaluations of the mechanical causes of bone injuries in sports are also addressed. The course teaches concepts and techniques of analysis, with practical examples taken from sports and exercise, gait analysis, physical rehabilitation, ergonomics, etc.

Prerequisites: Exercise Science 127 and Biology 133

Co-requisite: Exercise Science 387

EXS 387a Biomechanics Laboratory 1-0-3

This laboratory course demonstrates concepts in kinematics and kinetics learned in Exercise Science 317, and introduces students to the methods used in measuring and analyzing human movements.

Co-requisite: Exercise Science 317

Prerequisite: Biology Laboratory 133

EXS 373a Advanced Exercise Science 3-3-0

This course examines selected topics in Exercise Physiology. Through traditional lectures, directed readings, seminars, and case studies, students will study short-term and long-term adaptations to exercise. We will also examine the scientific principles underlying sports-related topics such as optimizing exercise performance, injuries, and injury repair.

Prerequisite: Exercise Science 127 or Biology 226

Co-requisite: Exercise Science 383

Note: See Biology 333. Students may not take this course for credit if they have received credit for BIO 333.

EXS 383a Advanced Exercise Science Laboratory 1-0-3

This laboratory course will introduce students to functional and clinically applied anatomy and physiology. They will experience evaluation and treatments of various musculoskeletal conditions, with an emphasis on sports related injuries. The student will work in both clinical and field settings. Case studies, injury reporting, and injury research will enable the student to learn independently and apply lecture material.

Co-requisite: Exercise Science 373

Note: See Biology Laboratory 333. Students may not take this course for credit if they have received credit for BIL333.