Faculty of Science

191 The Professors

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SM Morsink, PhD
AA Penin, PhD
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M van der Baan, PhD
J-P Zonneveld, PhD

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President and Vice-Chancellor
IV Samarasekera, O.C.

Registrar of the University

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One representative from the Faculties of Agricultural, Life and Environmental Sciences, Arts, Business, Education, Engineering, Faculté Saint-Jean, Medicine and Dentistry, Nursing, Pharmacy and Pharmaceutical Sciences, Physical Education and Recreation

One representative from the departments of Biochemistry, Pharmacology and Physiology

One representative from the Division of Computer Engineering

One representative from the Alumni Association

One representative from the Association of Professional Engineering, Geologists and Geophysicists of Alberta

Two Graduate Students from the Faculty of Science

Twelve Undergraduate Students from the Faculty of Science

192 Faculty Regulations

192.1 Faculty Overview

The Faculty of Science offers degrees in Actuarial Science, Applied Mathematics, Atmospheric Sciences, Biochemistry, Bioinformatics, Biological Sciences (Animal Biology, Cell Biotechnology, Environmental Biology, Evolutionary Biology, Microbiology, Molecular Genetics, Physiology and Developmental Biology, Plant Biology), Chemistry, Cell Biology, Computing Science, Computing Science with a Business Minor, Computing Science with Specialization in Bioinformatics, Computing Science-Software Quality Option, Computational Science (Mathematics or Physics), Environmental Earth Sciences, Environmental Physical Sciences, Geology, Geophysics, Immunology and Infection, Mathematical Physics, Mathematics, Mathematics and Economics, Mathematics and Finance, Neuroscience, Paleontology, Pharmacology, Physics, Physiology, Psychology, and Statistics.

A Business Minor, an Arts Minor and an Agricultural, Life and Environmental Sciences minor are available in the BSc General programs.

An Industrial Internship option is available in BSc Honors and Specialization programs. Students enrolled in the Honors or Specialization program have an opportunity to enhance their studies with an Industrial Internship. The Faculty of Science offers an Industrial Internship Program designed to provide the honors and specialization students a relevant industrial experience. Students must complete an 8-, 12- or 16-month work experience term at the end of their third year to receive Industrial Internship designation on their degree certificate. For more details, please see individual departmental listings

Preprofessional (e.g., Pre-Medicine, Pre-Dentistry, Pre-Optometry, Pre-Pharmacy) patterns may be taken in the Faculty.

192.2 Degrees

The Faculty offers three programs leading to the Bachelor of Science (BSc) degree: Honors, Specialization, and General.

The Faculty also offers a Bachelor of Science with Specialization in Science Education which is part of a five year BSc/BEd combined degrees program.

The four-year Honors programs are primarily for students who seek careers in scientific research. In addition, they prepare students for admission to graduate school, leading to a Master of Science (MSc) or a Doctor of Philosophy (PhD) degree.

The four-year Specialization programs do not concentrate on one subject to the same extent as the Honors programs. This allows students to choose from a broader range of courses and to take a greater number of courses in a secondary area of interest. They can provide the background necessary for admission to graduate schools, in some cases, and permit attainment of professional status in others.

The four-year General program provides a general education with a scientific emphasis for students who seek careers in business, teaching, medicine, dentistry, etc.

In many cases, transfer from one degree program to another can be easily arranged to suit students' changing ambitions, needs, or academic qualifications.

Regulations governing the Honors, Specialization, and General degree programs are found in §193.1, followed by descriptions of each degree program under the subject headings (§§193.1 to 193.19).

192.3 Admission

General admission requirements for the University are set out in §§13 and 14. Specific admission information for the Faculty of Science is detailed in §15.15.

192.4 Definitions

The following terms, definitions, and abbreviations are used throughout this section of the Calendar. Also see the Calendar's Glossary.

(1) **Approved Option**
In the Faculty of Science section, the term "approved option" appears only within the description of Honors and Specialization programs. For students registered in an Honors or Specialization BSc program, an "approved option" is a course (from Arts, Science, or another Faculty) approved in writing by the department directing the student's program.
General program students interested in taking courses from Faculties other than Arts or Science should see §192.6(1).

(2) **Arts Option**
Those courses offered by the Faculty of Arts for which the student is eligible, Christian Theology courses and Native Studies courses listed in §231, Course Listings. Note: Students registered in the Faculty of Science may not take SOC 210, 315 for degree credit.

(3) **Courses Attempted**
Refers to university or university transfer courses completed with a final grade and excludes courses from which a student has withdrawn with permission.

(4) **Courses Successfully Completed**
Refers to university with a final grade of D or higher.

(5) **Course Weight**
A unit of course weight indicates the instructional credit assigned to a course and is designated by the ★ symbol after the course number and name. Units of course weight form a part of the degree requirements and are also used to calculate a student's Grade Point Average (GPA).

(6) **Fall/Winter**
The instructional period of September to April.

(7) **Two-term Course**
A two-term course is a single course with ★6.

(8) **Term**
The instructional periods from September to December and January to April. In Spring/Summer, the instructional periods of May/June (Spring Term) and July/August (Summer Term).

(9) **Single-term Course**
A single-term course is a single course with ★3.

(10) **Junior Courses**
Those courses numbered 199 or lower.

(11) **Normal Course Load**
A normal, full academic course load is ★30 during Fall/Winter.

(12) **Option**
The term "option" where it appears in programs means a course chosen by the student from offerings by the Faculties of Arts or Science if the necessary prerequisites have been met.

(13) **Science Option**
Those courses offered by the Faculty of Science for which the student is eligible. Note: Not all courses offered by the Faculty of Science are available to students registered in the Faculty of Science.

(14) **Term**
Refers to Fall, Winter, Spring, or Summer Term.

(15) **Spring/Summer**
The instructional periods of May/June (Spring Term) and July/August (Summer Term).

(16) **Year of Program**
Year of program, as referred to throughout the Science section, is defined below. Students who are applying to, or continuing in, the Faculty of Science are considered to be in

a. Year 1 if they have successfully completed up to ★29 of their degree program;
b. Year 2 if they have successfully completed between ★30 and ★59 of their degree program;
c. Year 3 if they have successfully completed between ★60 and ★89 of their degree program;
d. Year 4 if they have successfully completed at least ★90 of their degree program.

192.5 Academic Standing

In all programs in the Faculty of Science, academic standing is assessed on the basis of Grade Point Average. An assessment of academic standing is conducted for each student at the end of the student's registration in the Fall/Winter regardless of the number of credits attempted and regardless of whether the student registered in one or both terms. Decisions regarding academic standing will be based on courses attempted during the previous Fall/Winter only. See §§23.4(6) and 23.9.2 for information on the calculation of GPA's and the academic record.

Continuation in Programs

Students are normally permitted to continue in their degree program if the degree requirements for the year's work are met. These requirements vary among the programs. In addition to the information below, the Calendar entry for each individual program should be consulted for further details.

192.5.1 Continuation in an Honors Program

Continuation in an Honors Program is by recommendation of the department concerned and depending on the department requires a minimum GPA of 3.0 on a course load of ★24 or 3.3 on a course load of ★30 in the preceding Fall/Winter. See the description of Honors programs in individual department sections for specific information regarding GPA and course load.

Those Honors students who do not meet the continuation requirements of their program may apply to transfer to a BSc Specialization program or to the BSc General program, provided they meet the continuation requirements of those programs. Students whose GPA is between 1.7 and 1.9 (and who have not previously been on Academic Warning or Probation) may be permitted to continue in the BSc General program on Academic Warning.

Students in an Honors program whose GPA at the end of Fall/Winter is below 1.7 will be required to withdraw from the Faculty.

192.5.2 Continuation in a Specialization Program

Continuation in a Specialization program is by recommendation of the department concerned and depending on the department requires a GPA of at least 2.3 on ★18, 2.3 on ★24 or 2.7 on a course load of ★18 or ★24 in the preceding Fall/Winter. See the description of Specialization programs in individual department sections for specific information regarding GPA and course load.

Those Specialization students who do not meet the continuation requirements of their program may apply to transfer to the BSc General program if they meet the minimum continuation requirements of the BSc General program. Students whose GPA is between 1.7 and 1.9 (and who have

not previously been on Academic Warning or Probation) may be permitted to continue in the BSc General program on Academic Warning.

Students in a Specialization program whose GPA at the end of Fall/Winter is below 1.7 will be required to withdraw from the Faculty.

192.5.3 Continuation in the General Program

Continuation in good standing in the General program requires a GPA of at least 2.0 in the preceding Fall/Winter. Students in the General program who have not previously been on Academic Warning or Probation and whose GPA at the end of Fall/Winter is between 1.7 and 1.9 will be permitted to continue on Academic Warning. See §192.5.5.

192.5.4 Unsatisfactory Standing—Required to Withdraw

This section is applicable to students in the Honors, Specialization, BSc/BEd Combined or General programs whose GPA at the end of Fall/Winter is below 1.7.

(1) **Students who have completed less than ★60 applicable to a BSc degree**

Students, whether in an Honors, Specialization, BSc/BEd Combined or the General program, who have completed less than ★60 applicable to a BSc degree (including the work completed during the Fall/Winter under review) and whose GPA at the end of Fall/Winter is below 1.7 will be required to withdraw from the Faculty.

Students, whether in an Honors, Specialization, BSc/BEd Combined or the General program, who have completed less than ★60 applicable to a BSc degree (including the work completed during the Fall/Winter under review) and whose GPA at the end of Fall/Winter is between 1.3 and 1.6 will be recommended for admission and permitted to apply to the Fresh Start program at the University of Alberta. Students who have previously been on Academic Warning, Probation or their equivalents, or who have been sanctioned for any academically-related Disciplinary offence at this University or in any other postsecondary program will not be recommended to the Fresh Start program. In referring students to the Fresh Start program, the Faculty may specify course requirements that must be fulfilled before the student will be considered for readmission to the Faculty of Science. If successful in the Fresh Start program and if all specified course requirements have been fulfilled, such students may apply for readmission to the Faculty of Science as transfer students as described in §15.15.7.

(2) **Students who have completed ★60 or more applicable to a BSc degree**

Students, whether in an Honors, Specialization, BSc/BEd Combined or the General program, who have completed ★60 or more applicable to a BSc degree (including the work completed during the Fall/Winter under review) and whose GPA at the end of Fall/Winter is below 1.7 will be required to withdraw.

192.5.5 Probation and Academic Warning

(1) **Probation**

Students who have been required to withdraw and who have successfully appealed that decision will be placed on Probation in the BSc General program. (See also §23.6.2.)

Probationary students are given one Fall/Winter in which to clear probation and are not eligible for any extension of Probation beyond one Fall/Winter.

Probationary students must successfully complete ★24 during their one Probationary Fall/Winter session. Probationary students will also be subject to specific course and program requirements.

Probationary students who fail to complete successfully ★24 with at least a 2.0 GPA on all work attempted during that Fall/Winter or who fail to fulfill all specified conditions of Probation will fail Probation and will be required to withdraw permanently from the Faculty of Science.

Only one period of Probation is allowed while registered in the Faculty of Science. Students who have cleared Probation and whose GPA at the end of a subsequent Fall/Winter falls below 2.0 will not be permitted to continue on Academic Warning, nor will they be allowed a second period of Probation. Such students are required to withdraw and will not normally be readmitted to the Faculty of Science.

(2) **Marginal Standing—Academic Warning**

Students, whether in an Honors, Specialization, BSc/BEd Combined or the General program, whose GPA at the end of Fall/Winter is between 1.7 and 1.9 will be deemed to have a Marginal Standing. Subject to the next paragraphs, they will be allowed to continue in the BSc General program for one further Fall/Winter on Academic Warning.

Only one period of attendance on Academic Warning will be allowed while registered in the Faculty of Science. Students who have received an Academic Warning in any previous Fall/Winter, or its equivalent at any other post-secondary institution, and whose current Fall/Winter GPA is between 1.7 and 1.9 will be required to withdraw from the Faculty. Such students can only apply for readmission after attending another postsecondary institution at which time they can apply for admission as a transfer student under the conditions described in §§14.2.1(5) and 15.15.7.

Note: Students under Academic Warning are only permitted to interrupt their programs with the prior written approval of the Senior Associate Dean. Students with marginal standing who want permission to interrupt their programs must make that request in writing by August 15 immediately following the ruling that placed them on Academic Warning. If students on Academic Warning interrupt their programs for more than 12 months without prior approval, readmission will not be granted unless the student meets the current readmission criteria. (This provision regarding permission to interrupt their program does not apply to students with marginal standing who attend another postsecondary institution in the interim. Such students must reapply as transfer applicants, see §15.15.7).

192.5.6 Continuation in the BSc (Specialization in Science and Education) and BEd (Secondary) Combined Degrees Program

Continuation in the BSc Specialization in Science and Education/BEd (Secondary) combined degrees program requires a Grade Point Average (GPA) of at least 2.3 in the Fall/Winter. (See §23.4(6) regarding the rules for calculating Grade Point Average).

A student who does not meet the requirement to continue in the combined degrees program must withdraw from the program and may apply for admission to either a BSc General program or a BEd program, if eligible. Refer to §73.4 for academic standing regulations for admission to the BEd program and to §193.1.3 for academic standing regulations for admission to the BSc General program.

192.5.7 Scholarship, First-Class Standing

(1) **Scholarship**

The basis for scholarship consideration is passing grades in all courses on load of at least ★30.

(2) **First-Class Standing**

First-class standing in a given Fall/Winter is awarded to any student who obtains a GPA of not less than 3.5 while enrolled in ★24 or more during that Fall/Winter. This is also referred to as the Dean's Honor Roll.

192.5.8 Graduation Year

Students who have completed ★120 or more and who have either not applied to graduate, or who have applied but have not met graduation requirements, are permitted to register only in those courses necessary to complete their current program as quickly as possible. Such students must have the written approval of the Associate Dean of Science for every course beyond ★120 in which they register. Students in Honors or Specialization programs must also have the written approval of their Departmental Advisor.

192.5.9 Reexamination

Reexaminations are not normally permitted in the Faculty of Science. Students registered in the Faculty of Science wishing to be considered for a reexamination must, in addition to meeting the requirements set out in §23.5.5, also meet the following conditions:

(1) Students must provide evidence of a medical condition or similarly compelling circumstance existing at the time of the writing of the final examination; and

(2) provide evidence that the student's performance in the final examination was so affected by circumstances as shown in (a) that there was a substantial difference between the final examination results and the term work; and

(3) excluding the final exam, must have completed at least one-half of the term work.

Note: Registrants in BSc degree programs in the Faculty of Science who fail to meet the graduation requirements may be granted a reexamination in **one** passed or failed Science course taken in the final Fall/Winter or Spring/Summer (last ★30 or less) provided the maximum number of reexaminations (★12) has not been previously taken. Such courses must qualify for reexamination, according to §23.5.5.

192.6 Courses

(1) **Selection of Courses**

Students are responsible for familiarizing themselves with program requirements and limitations as specified in the Calendar, for ensuring their programs are properly planned in accordance with degree specifications, and for the completeness and accuracy of their registration. Please read the Calendar carefully before registering in courses, and if you are in doubt about any regulations pertaining to your program, consult the Faculty of Science Office (CW 223 Biological Sciences) for clarification.

Students registered in the Faculty of Science must select courses offered by the Faculty of Arts or by the Faculty of Science. In some instances, courses from other Faculties may be permitted by permission of the Dean or designee. Written approval from the Faculty of Science is required if more than ★30 are taken in a Fall/Winter, except in those Honors and Specialization programs requiring more than ★30 in a given year.

(2) **Selection of First-Year Courses**

Beginning first-year students who have completed no credits toward their programs normally restrict their registration to junior courses. First year students contemplating taking senior level courses should be careful to ensure that they have completed any prerequisites.

(3) **Withdrawal from Courses**

Courses from which the student withdraws up to and including the last day for registration in the Fall and Winter Terms will not appear on the student's record. Courses from which the student withdraws after the last day of registration and up to and including the last day for dropping courses will appear with a grade of "W" (Withdrew with permission) on the transcript.

Deadlines for withdrawing from courses are listed in §11.

(4) **Prerequisites**

Courses with prerequisites may only be used for degree credit if the prerequisite requirements are met.

A grade of D is the minimum grade acceptable in a course which is to be used as a prerequisite.

Where a prerequisite is stated, it is understood that equivalent courses may be used to satisfy the requirement. In addition, the department offering a course with prerequisite requirements may waive the prerequisite in writing. (Prerequisite waiver forms are available from the Faculty of Science office and the Department offices).

Students who are unsure if they meet the prerequisite requirements in a course, or who wish to obtain permission to have a prerequisite waived, should consult the department offering the course.

(5) **Repeating Courses**

No student will be permitted to repeat any University course, whether a failed course or a course having a grade of W, more than once except for reasons deemed sufficient by the Council of the Faculty in which the student is enrolled. For Science students, the Faculty will withhold credit or indicate the course is extra to degree on any course that contravenes this regulation.

Normally, a student will not be permitted to repeat a course in which a grade of D or more has been received.

Only two exceptions are permitted, and each requires written approval of the Dean or designee:

a. When a higher grade is necessary for a course that is required in one of the degree programs
b. When a student in Satisfactory Standing in the last year of a degree program repeats one course to raise the GPA to the level required by the degree program

A student who repeats a course in which a grade of D or more has been received, without written permission of the Faculty of Science, will have the grade attained on the initial passing of the course used for the purpose of meeting degree requirements, and no credit will be assigned to the repeated course.

192.7 Graduation

(1) **Application for Graduation**

Students who intend to receive a BSc (General, Specialization, or Honors) Degree or Special Certificate must apply for the Degree or Certificate on Bear Tracks (https://www.beartracks.ualberta.ca) by February 1 for Spring Convocation or by September 1 for Fall Convocation. All official transcripts from other post-secondary institutions are due by May 1 for Spring Convocation or by October 1 for Fall Convocation.

(2) **Degree Requirements**

All BSc Degrees require a minimum of ★120. Courses with weights of ★0 are offered for credit only, and, although they may be required in specific degree programs, cannot be used to meet the minimum units of course weight requirement in any degree program.

(3) **Convocation**

All requirements for graduation at Spring Convocation must be met by the end of Fall/Winter. Those completing degree requirements during Spring/Summer will graduate at the Fall Convocation.

(4) **First-Class Honors**

First-class Honors Degrees are awarded to any student in an Honors program who obtained:

a. A GPA of at least 3.5 in each of the last two Fall/Winters of the program; and
b. A GPA of at least 3.5 on the last ★60 of the program. If determination of the **last ★60** requires consideration of one or more courses from a given Fall/Winter or Session, then all courses from that Fall/Winter or Session will be used in calculating whether the student has achieved a 3.5 average for the purposes of qualifying for First-class Honors.

(5) **With Distinction**

The notation "With Distinction" is inscribed on the parchment of a candidate for a General or Specialization degree if the candidate has obtained a GPA of not less than 3.5 over the last ★60 and if the student successfully completed ★24 or more in each of the last two Fall/Winters. If determination of the last ★60 requires consideration of one or more courses from a given Fall/Winter or Session, then all courses from that Fall/Winter or Session will be used in calculating whether the student has achieved a 3.5 average for the purposes of qualifying for With Distinction.

Further regulations regarding academic standing, promotion, and graduation vary from program to program within the Faculty of Science, and are therefore given in §193 below. Regulations for Honors, Specialization, and General programs are found in §193.1.

192.8 Appeals and Grievances

A copy of Faculty of Science regulations regarding appeals on grades and academic standing may be obtained from the Faculty Office (CW 223 Biological Sciences Building). Certain academic standing decisions made by the Faculty Academic Appeals Committee may be appealed to the General Faculties Council Academic Appeals Committee. See §23.8.

Note: Deadlines exist for submission of appeals. Contact the Faculty for details.

192.9 Visiting Student Status

Permission to attend another institution as a Visiting Student depends on the student remaining in good academic standing in the Faculty of Science at the University of Alberta.

A student while registered in the Faculty of Science cannot attend two postsecondary institutions at the same time and will not receive permission to register as a Visiting Student at another institution if the equivalent course is given on campus in the same term, except in the case of formal exchange programs. Transfer credits will not be awarded if a student attends another postsecondary institution without first obtaining a current Letter of Permission from the Faculty of Science.

192.10 Study Abroad

The Faculty of Science encourages all full-time students who have completed at least ★15 credits at the University of Alberta, who are in satisfactory standing in their program with a CGPA of at least 2.5 and have a GPA of at least 2.7 in their most recently completed term, to consider a period of study abroad. This program is administered by University of Alberta International and details of this competitive program can be found on their website www.international.ualberta.ca/studyabroad.

Where possible, credit for courses successfully completed in study abroad programs will be granted transfer credit by the Faculty of Science. However, there may be courses required in a program where there is no substitute available elsewhere. Thus a period of study abroad may extend the time required to complete a BSc degree. Science students should maintain satisfactory standing during study abroad however they will not be held to the course load and GPA expectations of their individual programs. The thesis-based independent research project required in many honors programs must be completed at the University of Alberta.

193 Programs of Study

193.1 BSc in the Honors, Specialization, and General Programs

193.1.1 Honors Programs

A minimum of ★120 normally taken in no more than five consecutive academic years is required to complete the Honors program for the degree of BSc with Honors. Some departments require that an Honors program be completed in four years, others permit five. See individual departments for details. These programs provide specialization in the chosen subject or subjects as well as the higher standard implied by the term "Honors."

Honors programs are available in the Departments of Biochemistry, Biological Sciences, Cell Biology, Chemistry, Computing Science, Earth and Atmospheric Sciences, Mathematical and Statistical Sciences, Neuroscience, Pharmacology, Physics, Physiology, and Psychology. Honors is the preferred program for students who plan graduate study.

Admission

See §15.15.3 for admission requirements.

Selection of Courses

The following regulations govern Honors programs:

(1) In each year, an Honors student's program must be approved by an Honors advisor in the student's Department and by the Faculty Office.

(2) A minimum of ★72 in Science is required in most Honors programs. Certain Departments may require more than ★72 in Science courses.

(3) A student normally must take at least ★18 in Arts courses as part of the requirements for the Honors degree.

(4) Normally, no more than ★42 in junior (100-level) courses are permitted in Honors programs.

(5) Certain non-Arts and non-Science courses appropriate to the program may be permitted in Honors programs with the written approval of the Department directing the student's program.
Applicants to the BSc Honors program who have taken non-Arts and non-Science courses before application will have the potential to transfer credit for such courses assessed at the time of admission to the program.

Course Load Requirements

Students in Honors programs must complete ★24 or more during the Fall/Winter of each year of the program. In some Departments, Honors students are required to complete ★30 each Fall/Winter. See individual Departments for details. Exceptions to course load requirements must be approved in advance each year by the Department and the Faculty Office.

Academic Standings and Graduation

The following regulations govern Honors programs:

(1) Continuation in an Honors program is by recommendation of the department concerned and requires a GPA of at least 3.0 on a course load of ★24 or more in the preceding Fall/Winter periods. See description of Honors programs of individual departments for additional requirements relating to continuation in the Honors program. Students must be in good standing in the Honors program in order to graduate.

(2) A student who fails to attain the standard necessary for continuance in Honors must withdraw from the Honors program. In so doing, the student may transfer to a Specialization program with the appropriate department's approval or to the General program in the Faculty of Science. Students applying to transfer from an Honors program to Specialization or General must meet the continuation standards for the program concerned.

(3) A student who fails to complete the requirements for a degree with Honors in the fourth year may be granted the Specialization degree or the General degree on application if the courses taken and the standing attained are satisfactory. Such students must apply to transfer to a Specialization or General program.

(4) Degrees with Honors are awarded in two classes: First-Class Honors and Honors. For First-Class Honors, a GPA of at least 3.5 on the last ★60 of the program. If determination of the **last ★60** requires consideration of one or more courses from a given Fall/Winter or Session, then all courses from that Fall/Winter or Session will be used in calculating whether the student has achieved a 3.5 average for the purposes of qualifying for First Class Honors.

Residence Requirement

A student transferring to the Faculty of Science with advanced standing must complete at least ★60 (normally the last 60) while registered in the Faculty of Science at the University of Alberta.

Time Limits for Program Completion

Some Departments require that Honors programs be completed in four consecutive Fall/Winter periods. Others permit five consecutive Fall/Winters. See individual Departments for details. An Honors program may be interrupted only by special permission of the Department and the Dean.

193.1.2 Specialization Programs

Four-year programs, comprising a minimum of ★120, provide education to a professional level and lead to the degree of BSc with Specialization.

Specialization programs are available in the Departments of Biochemistry, Biological Sciences, Cell Biology, Chemistry, Computing Science, Earth and Atmospheric Sciences, Mathematical and Statistical Sciences, Pharmacology, Physics, and Psychology.

A five-year (★150) BEd/BSc (Specialization in Science and Education) program with majors and minors in Biological, Mathematical, and Physical Sciences is also available (see §§15.15.6 and 75.6).

Admission

See §15.15.4 for admission requirements.

Selection of Courses

The following regulations govern Specialization programs:

(1) In each year, a Specialization student's program must be approved by a Specialization advisor in the appropriate Department and by the Faculty Office.

(2) A minimum of ★72 in Science is required in most Specialization programs. Certain Departments may require more than ★72.

(3) A student must take at least ★18 in Arts courses as part of the requirements for most Specialization degrees.

(4) Normally, no more than ★42 in junior courses are permitted in Specialization programs.

(5) Certain non-Arts and non-Science courses appropriate to the program may be permitted in Specialization programs with the prior written approval of the Department directing the student's program.
Applicants to the BSc Specialization program who have taken non-Arts and non-Science courses before application will have the potential transfer credit for such courses assessed at the time of admission to the program.

Course Load Requirements

To graduate in four years normally requires that BSc Specialization students take the usual full course load of ★30 in each Fall/Winter of the program. Students who wish to extend their programs are still expected to complete at least ★24 in each Fall/Winter of the program. Exceptions to course load requirements must be approved in advance each year by the Department and the Faculty Office. (See Time Limits for Completion of Program below.)

Academic Standings and Graduation

The following regulations govern Specialization programs:

(1) Continuation in a Specialization program is by recommendation of the Department concerned and requires a GPA of at least 2.3 in each of the preceding Fall/Winter periods. See description of Specialization programs of individual departments for additional requirements relating to promotion in the Specialization program. Students must be in good standing in the Specialization program in order to graduate.

(2) A student who fails to attain the standard necessary for continuation in the Specialization program will be required to withdraw from that program. In so doing, the student may apply to transfer to the General program in the Faculty. Students applying to transfer from a Specialization to the General program must meet the continuation GPA of 2.0.

(3) A student who fails to complete the requirements for a Specialization degree in the fourth year may be granted the General degree forthwith on application if the courses taken and the standing attained are satisfactory. Such students must apply to transfer to the General program.

(4) For graduation, a program of at least ★120 credited to the degree.

(5) BSc Specialization degrees with Distinction are awarded when students achieve a GPA of at least 3.5 on the last ★60 if the student was enrolled in a normal course load (minimum ★24) during each Fall/Winter of the last two years.

Residence Requirement

A student transferring to the Faculty of Science with advanced standing must complete at least ★60 (normally the last ★60) while registered in the Faculty of Science.

Time Limits for Completion of Program

The BSc Specialization program is a four-year program, but students who wish to extend their programs to a fifth year may do so (see course load requirements above). Students who wish to extend their programs beyond five years must first obtain the written approval of the Faculty of Science and the Department.

193.1.3 General Programs

The BSc General program provides students with a diverse education in more than one branch of study and includes a major and minor subject or area of concentration. Students must major in a Science subject or area of concentration. Students may elect to minor in a Science subject or area of concentration, an Arts subject of concentration, an Agricultural, Life and Environmental Sciences minor, or a Business minor. In addition to providing a BSc General Degree, this program allows for subsequent transfer to Specialization and Honors programs. Students who intend to transfer to Honors programs in Biochemistry, Neuroscience, Pharmacology, Physiology or Psychology must complete ★30 in each Fall/Winter preceding admission to the Honors program. All other students who intend to transfer to Honors programs must complete ★24 in each Fall/Winter preceding admission to the Honors program. Students enrolled in the General program who intend to transfer to another program should consult the appropriate admission requirements for the particular program of interest in §15.15 and carefully select their first-year core courses in accordance with the requirements of the specific program.

Students who tentatively plan to transfer to an honors or specialization program should initially complete courses toward a Science or Arts minor in accordance with BSc General regulations.

Admission

See §15.15.1 for admission requirements for the BSc (General) programs.

Selection of Courses

The following regulations govern the General program:

(1) A student's program must be approved by an advisor in the Faculty Office each academic year.

(2) To obtain a BSc General Degree, a student must receive credit in ★120. At least ★72 and not more than ★102 must be in Science. At least ★18 and not more than ★48 must be in Arts.

(3) Each student must complete a Science major. A minimum of ★36 and a maximum of ★48 are required in the major, with no more than ★18 at the junior level. At least ★12 must be 300-level or higher courses taken while registered in the Faculty of Science at the University of Alberta.

Each student must also either

a. complete a second Science major. Students who complete a second Science major will have the Double Majors recorded on their transcripts and diplomas; or

b. complete a minor. The minor may be in Science, or in Agricultural, Life and Environmental Sciences, Arts or Business. For a list of Agricultural, Life and Environmental Sciences minors, see §193.1.4. For a list of Arts subjects available as a minor, refer to "Minors". For information about admission to the Business minor, see §15.15.2. Requirements for a Business minor appear in §193.1.5. At least ★24 and not more than ★36 are required in the minor with no more than ★12 at the junior level. If the minor is a Science minor, at least ★6 must be in 300-level or higher courses taken while registered in the Faculty of Science at the University of Alberta. If the minor is an Arts minor, additional requirements as specified by the Arts Department may be required. Students are responsible for meeting any additional departmental requirements as specified by the Faculty of Arts.

Majors

A Science major consists of Science courses taken from one of the following nine subject areas:

Biological Sciences (see Note 1): Choose courses from BIOCH (see Note 2), BIOIN (see Note 3), BIOL, BOT, ENT, GENET, IMIN, MA SC, MICRB, NEURO, PALEO (see Note 4), PHYSL, PMCOL, ZOOL.

Chemistry: Choose courses from BIOCH (see Note 2), CHEM.

Earth and Atmospheric Sciences: Choose courses from Science EAS courses (see Note 5), GEOPH, PALEO (see Note 4).

Mathematical Sciences: Choose courses from BIOIN (see Note 3), CMPUT, MA PH (see Note 6), MATH, STAT.

Mathematics: Choose courses from MATH.

Physical Sciences (see Note 7): Choose courses from ASTRO, BIOCH (see Note 2), CHEM, GEOPH, MA PH (see Note 6), PHYS.

Physics: Choose courses from ASTRO, GEOPH, MA PH (see Note 6), PHYS.

Science Psychology: Choose courses from Science PSYCO courses.

Statistics and Applied Probability: Choose courses from STAT.

Notes:

(1) For additional Biological Science courses and information see §§193.3.6 and 194.

(2) All BIOCH courses will be counted either as Biological Sciences or Physical Sciences or Chemistry.

(3) All BIOIN courses will be counted either as Biological Sciences or Mathematical Sciences or Computing Sciences.

(4) All PALEO courses will be counted either as Biological Sciences or Earth and Atmospheric Sciences.

(5) For additional Earth and Atmospheric Sciences information see §193.7.

(6) All MA PH courses will be counted either as Mathematical Sciences or Physical Sciences or Physics.

(7) EAS 323 may be used as a Physical Science.

Minors

A Science minor consists of Science courses taken from one of the following areas: Biological Sciences, Chemistry, Computing Science, Earth and Atmospheric Sciences (Science EAS), Mathematical Sciences, Mathematics, Physical Sciences, Physics, Psychology (Science PSYCO), or Statistics and Applied Probability. For information about the BSc General – Computing Science minor, see §193.6.8. For information about the BSc General – minor in Agricultural, Life and Environmental Sciences, see §193.1.4. For information about the BSc General – minor in Business, see §193.1.5.

If the minor is from the Faculty of Arts, further requirements as specified by the Arts Department must be met. See Faculty of Arts §§43.1 to 44.32 for specific requirements for minors, by Department. The following Arts subjects may be taken as a minor: Anthropology; Art and Design; Biblical Hebrew; Central/East European Studies; Chinese; Christian Theology; Classical Studies; Classical Languages; Comparative Literature; Creative Writing; Drama; East Asian Studies; Economics; English; Film Studies; French; Human Geography (see Note); German; History, Ancient or Medieval History, History of Art, Design and Visual Culture; International Studies; Italian; Japanese; Latin American Studies; Linguistics; Middle Eastern and African Studies; Music; Native Studies; Philosophy; Polish; Political Science; Arts Psychology (see Note); Religious Studies; Russian; Scandinavian; Science, Technology and Society; Sociology; Spanish; Ukrainian; Women's Studies.

Note: The major and minor may not share courses from the same department. The following combinations are not allowed:

Arts Geography/Earth Sciences

Arts Psychology/Science Psychology

Courses in the major and minor may not overlap. For example, if the major is Mathematical Sciences, and the minor is Statistics, the major may be made up of Mathematics courses and Computing Science courses, but no Statistics courses. The minor would consist exclusively of Statistics courses.

(4) The General program features a first-year core of courses which must include the following:

a. ★6 from among junior courses offered by the Department of English (normally to be chosen from ENGL 111, 112, 113, 114)

b. ★6 from among junior courses offered by the Departments of Computing Science, and Mathematical and Statistical Sciences (CMPUT 101 or 114 or 174; CMPUT 115 or 175; MATH 113 or 114 or 117; MATH 115 or 118; MATH 120 or 125; MATH 153; STAT 141 or 151

c. ★6 from among junior courses in the Departments of Chemistry or Physics (ASTRO 120, 122; CHEM 101, 102, 164; PHYS 124, 126, 144, 146)

d. ★6 from among junior Science courses titled Biology, Earth and Atmospheric Sciences, or Science Psychology (BIOL 107, 108; EAS 100, 105; PSYCO 104)

e. ★6 from among 100-level courses in Arts or Science. Students interested in the Business minor must take ECON 101 and 102.

(5) Normally, at least ★30 at the junior level must be successfully completed before a student may register in senior-level courses.

(6) Not more than ★42 of all courses taken can be at the junior level.

(7) Each student must successfully complete a minimum of ★12 at the 300-level (or higher) in the major and, in addition, at least ★6 at the 300-level (or higher) in the minor while registered in the Faculty of Science at the University of Alberta.

(8) Subject to receiving written approval from the Faculty of Science Office before registration, a maximum of ★12 may be taken from Faculties other than Arts or Science. For applicants to the BSc General who have already taken courses from Faculties other than Arts or Science, potential transfer credit for such courses will be assessed at the time of admission to the program.

Such subjects are not included as part of the major or minor, nor toward the minimum requirement of ★18 in Arts, nor toward the minimum requirement of ★72 in Science.

Note: In Women's Studies minor, courses not in Arts or Science but in the list of "cross-listed courses" may count toward the minor in Women's Studies (see §44.31).

Course Load Requirements

Students in the General program should normally take ★30 during the Fall/Winter of each year of the program.

Academic Standing and Graduation

The following regulations govern General Programs:

(1) To obtain a BSc General degree, a minimum 2.0 GPA must be attained on the last ★60 credited to the degree. Moreover, a minimum 2.3 GPA must be attained in all courses in the major. Students must be in Satisfactory Standing in the General program in order to graduate (a minimum 2.0 GPA in the final Fall/Winter).

(2) BSc General degrees with Distinction are awarded when students achieve a GPA of 3.5 or higher over the last ★60 if the students have satisfactorily completed at least a normal academic load of a minimum of ★24 during the Fall/Winter periods of the last two years at the University of Alberta.

Residence Requirement

A student transferring to the Faculty of Science with advanced standing must complete at least ★60 applicable to the BSc program while registered at the University of Alberta. Normally, at least ★30 of the last ★60 must be completed while registered in the Faculty of Science.

Time Limits for Program Completion

The Faculty of Science may permit a student to complete the requirements for a General degree over a period longer than four years or meet the requirements in a shorter time by attending Spring/Summer.

193.1.4 BSc General—Minor in Agricultural, Life and Environmental Sciences

Students may choose a minor in Agriculture, Human Ecology or Nutrition. All other restrictions and requirements of the BSc General program, as outlined in §193.1.3 apply.

Minor in Agriculture

The minor in Agriculture consists of at least ★24 and no more than ★30 in Agriculture courses as follows:

(1) AN SC 200

(2) AREC 200 (Prerequisite of ECON 101 or consent of Department)

(3) PL SC 221

(4) SOILS 210 (Prerequisite: Must have completed a university-level course in life or natural sciences. A university-level chemistry course is strongly recommended.)

(5) ★12 to ★18 in additional courses at the 300-level or higher to be chosen from AN SC, AREC, ENCS, PL SC or SOILS.

Minor in Human Ecology

The minor in Human Ecology consists of at least ★24 and no more than ★30 in Human Ecology as follows:

(1) HECOL 100

(2) HECOL 200

(3) HECOL 150 or 170

(4) ★3 from HECOL 212, 310 or 313

(5) ★12 to ★18 in HECOL courses, with at least ★9 at the 300-level.

Minor in Nutrition

The minor in Nutrition consists of at least ★24 and no more than ★30 in Nutrition with no more than ★12 at the 100-level, as follows: NU FS 305, 352, 356; NUTR 100

★12 from the following: NU FS 223, 200, 373, 377, 400, 401; NUTR 480

Biochemistry is a recommended prerequisite.

193.1.5 BSc General—Minor in Business

Note: For requirements, see §193.1.3. Students admitted to the program lacking one or more prerequisites will be required to make up the deficiency during the first Fall/Winter in the Business minor program.

BSc General program students admitted to the minor in Business quota must complete the following:

(1) ECON 101, 102

(2) ★18 to ★30 in courses offered by the Faculty of Business including ACCTG 311; SMO 301; two of FIN 301, MARK 301, MGTSC 352, SMO 321

Notes

(1) Several of the above courses have one or more Arts or Science courses as prerequisites. These prerequisites must be met.

(2) Students completing a minor in Business must still choose a major in Science and must satisfy the requirement that at least ★72 of the ★120 credited to the degree be in Science.

(3) Students minoring in Business must still complete at least ★18 in Arts. ECON 101 and ECON 102 constitute six of those required Arts units.

Once admitted to the minor in Business, students in the BSc General program will be allowed to continue in the Business minor as long as they remain in good standing in the BSc General program. BSc General program students who have been admitted to the minor in Business and who subsequently apply to transfer to a Specialization or Honors program which has a Business component controlled by quota will have to apply and compete for admission to that quota.

193.1.6 BSc (Specialization in Science and Education)/BEd (Secondary) Combined Degrees Program

The Faculties of Science and Education offer a combined degrees program that is more highly structured than the BSc followed by a BEd After-Degree (a six year route). It provides less flexibility in course choice and scheduling than taking the degrees sequentially, because it is designed to meet the minimum requirements of both degrees in five years. In addition, it must meet teacher certification requirements within this time frame.

To accommodate the variety in subject studies needed in secondary school teaching, students in the combined degrees program will select both a major/minor from the following areas:

Biological Sciences: Biology, Botany, Entomology, Genetics, Immunology and Infection, Marine Science, Microbiology, Neuroscience, Paleontology, Pharmacology, Physiology, Zoology.

Physical Sciences: Astronomy, Chemistry, Mathematical Physics, Physics.

Mathematical Sciences: Computing Science, Mathematics, Statistics and Applied Probability.

Admission

Students apply to the Faculty of Science for admission to the Combined Degrees Program and normally spend the first two years of the five-year program registered in the Faculty of Science. (See §15.15.6)

Selection of Courses

The following regulations govern the combined degrees program:

(1) A student's program must be approved by an advisor in the appropriate Faculty prior to the start of each Fall/Winter.

(2) Within the ★150 program, a student must complete a minimum of ★72 in Science, ★45 in Education and ★18 in Arts.

(3) In the major, at least ★12 must be in 300-level or higher courses taken while registered in the BSc/BEd Combined degree at the University of Alberta.

(4) In the minor, at least ★6 must be in 300-level or higher courses taken while registered in the BSc/BEd Combined degree at the University of Alberta.

(5) Normally, no more than ★42 at the 100-level are permitted in the combined degrees program.

Science Chart 1 BSc (Specialization in Science and Education)/BEd

Note: Year 1 and Year 2 are completed in the Faculty of Science. Years 3, 4 and 5 are completed in the Faculty of Education.

Physical Sciences Major/Biological Sciences Minor (★150)

Core Program Requirements	Year 1 (★30)	Year 2 (★30)	Year 3 (★30)	Year 4 (★30)	Year 5 (★30)
Education: ★45 Major: ★42 Minor: ★27 100-level: ★36 (Maximum ★42) **Graduation Requirements:** GPA of 2.3 on **all** courses GPA of 2.7 on **Major** courses **Area "B"** BIOL 315, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375, PHYS 212, 213, 261, 264, SOC 462, STS 200, WST 350 **Area "C"** ASTRO 320, 322, any 300-level CHEM or PHYS. **Note:** It is the student's responsibility to ensure all prerequisites for 300-level courses are met.	1. BIOL 107, 108 2. CHEM 101, 102 3. ★6 junior English 4. MATH 113 or 114 5. MATH 115 6. PHYS 124 or 144 7. PHYS 126 or 146	1. BIOL 207, 208 2. CHEM 261 3. CMPUT 101, 114, or 174 4. EDU 250 or ★3 Education Option 5. EDPY 200 6. PHYS 224 7. ★3 chosen from PHYS 200, 208, 271 8. ★3 chosen from CHEM 211 or PHYS 294 9. ★3 Arts options	1. CHEM 263 2. ★3 chosen from CHEM 211 or PHYS 294 not already taken 3. ★6 in Biological Sciences at the 200-level 4. ★6 Arts options 5. ★6 Area "B" 6. ★6 Area "C"	1. EDFX 350 2. EDPS 310 3. EDPY 301 4. EDPY 303 5. EDSE 352 6. EDFX 450 7. EDSE 451 8. EDSE 460 9. EDSE 461 **Notes:** (1) Courses 1 through 5 above constitute the Introductory Professional Term and must be taken concurrently. (2) Courses 6 through 9 above constitute the Advanced Professional Term and must be taken concurrently.	1. EDPS 410 2. ★6 in Biological Sciences at the 300- or 400-level 3. ★3 Arts options 4. ★6 Education options 5. ★3 Non-Education options 6. ★3 Science options 7. ★6 Area "C"

Physical Sciences Major/Mathematical Sciences Minor (★150)

Core Program Requirements	Year 1 (★30)	Year 2 (★30)	Year 3 (★30)	Year 4 (★30)	Year 5 (★30)
Education: ★45 Major: ★42 Minor: ★27 100-level: ★36 (Maximum ★42) **Graduation Requirements:** GPA of 2.3 on **all** courses GPA of 2.7 on **Major** courses **Area "B"** BIOL 350, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375, PHYS 212, 213, 261, 264, STS 200, SOC 462, WST 350 **Area "C"** ASTRO 320, 322, any 300-level CHEM or PHYS. **Note:** It is the student's responsibility to ensure all prerequisites for 300-level courses are met.	1. BIOL 107, 108 2. CHEM 101, 102 3. ★6 junior English 4. MATH 113 or 114 5. MATH 115 6. PHYS 124 or 144 7. PHYS 126 or 146	1. CMPUT 101, 114, or 174 2. CHEM 261 3. EDU 250 or ★3 Education Option 4. EDPY 200 5. MATH 120 6. MATH 214 7. PHYS 224 8. ★3 chosen from PHYS 200, 208, 271 9. ★3 chosen from CHEM 211 or PHYS 294 10. ★3 Arts options	1. CHEM 263 2. MATH 228 3. MATH 215 or 241 4. ★3 chosen from CHEM 211 or PHYS 294 5. ★6 Arts options 6. ★6 Area "B" 7. ★6 Area "C"	1. EDFX 350 2. EDPS 310 3. EDPY 301 4. EDPY 303 5. EDSE 337 6. EDFX 450 7. EDSE 451 8. EDSE 460 9. EDSE 461 **Notes** (1) Courses 1 through 5 above constitute the Introductory Professional Term and must be taken concurrently. (2) Courses 6 through 9 above constitute the Advanced Professional Term and must be taken concurrently.	1. EDPS 410 2. ★6 in Mathematics at the 300 or 400- level 3. ★3 Arts options 4. ★6 Education options 5. ★3 Non-Education options 6. ★3 Science options 7. ★6 Area "C"

Mathematical Sciences Major/Physical Sciences Minor (★150)

Core Program Requirements	Year 1 (★30)	Year 2 (★30)	Year 3 (★30)	Year 4 (★30)	Year 5 (★30)
Education: ★45 Major: ★45 Minor: ★27 100-level: ★39 (Maximum ★42) **Graduation Requirements:** GPA of 2.3 on **all** courses GPA of 2.7 on **Major** courses **Area "A"** BIOCH 200, CHEM 211, 263, PHYS 200, 208, 271 **Area "B"** BIOL 315, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375, PHYS 212, 213, 261, 264, STS 200, SOC 462, WST 350 **Area "C"** ASTRO 320, 322, any 300-level CHEM or PHYS **Note:** It is the student's responsibility to ensure all prerequisites for 300-level courses are met.	1. BIOL 107, 108 2. ★6 junior English 3. MATH 114 4. MATH 115 5. MATH 120 6. STAT 151 7. ★6 in Physics or Chemistry chosen from CHEM 101, 102, PHYS 124 or 144, 126 or 146.	1. EDU 250 or ★3 Education option 2. EDPY 200 3. MATH 214 4. MATH 215 5. MATH 228 6. MATH 241 7. ★6 in Physics or Chemistry chosen from CHEM 101, 102, PHYS 124 or 144, 126 or 146. 8. ★CHEM 261 9. ★3 Arts options	1. EDFX 350 2. EDPS 310 3. EDPY 301 4. EDPY 303 5. EDSE 364 6. CMPUT 101, 114, or 174 7. ★3 Area "A" 8. PHYS 224 9. ★3 in MATH 2XX 10. ★3 Area "B"	1. EDFX 450 2. EDSE 451 3. EDSE 437 4. EDSE 438 5. ★3 in Mathematics at the 200-, 300- or 400-level 6. ★3 in Mathematics at the 300- or 400- level 7. ★3 Arts option 8. ★3 Area "A" 9. ★3 Area "B" **Note:** Courses 1 through 4 above constitute the Advanced Professional Term and must be taken concurrently.	1. EDPS 410 2. ★9 in Mathematics at the 300 or 400- level 3. ★6 Education options 4. ★3 Arts options 5. ★3 Science options 6. ★6 Area "C"

Science Chart 1 BSc (Specialization in Science and Education)/BEd (cont'd)

Mathematical Sciences Major/Biological Sciences Minor (★150)

Core Program Requirements	Year 1 (★30)	Year 2 (★30)	Year 3 (★30)	Year 4 (★30)	Year 5 (★30)
Education: ★45 Major: ★45 Minor: ★24 100-level: ★33 (Maximum ★42) **Graduation Requirements:** GPA of 2.3 on all courses GPA of 2.7 on major courses **Area "B"** BIOL 315, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375, PHYS 212, 213, 261, 264, SOC 462, STS 200, WST 350 **Note:** It is the student's responsibility to ensure that all prerequisites for higher level courses are met.	1. BIOL 107, 108 2. ★6 junior English 3. MATH 114 4. MATH 115 5. MATH 120 6. STAT 151 7. ★6 in Physical Sciences at the 100-level	1. BIOL 207, 208 2. EDU 250 or ★3 Education option 3. EDPY 200 4. MATH 214 5. MATH 215 6. MATH 228 7. MATH 241 8. ★6 Arts options	1. EDFX 350 2. EDPS 310 3. EDPY 301 4. EDPY 303 5. EDSE 352 6. ★3 CMPUT 101 or 114 7. ★3 in Biological Sciences at the 200-level 8. ★3 in Mathematics at the 200-level 9. ★3 Arts options 10. ★3 Area "B" **Note:** Courses 1 through 5 above constitute the Introductory Professional Term and must be taken concurrently.	1. EDFX 450 2. EDSE 451 3. EDSE 437 4. EDSE 438 5. ★3 in Biological Sciences at the 200-, 300- or 400-level 6. ★3 in Mathematics at the 200-, 300- or 400-level 7. ★3 in Mathematics at the 300- or 400-level 8. ★3 Arts options 9. ★3 Area "B" **Note:** Courses 1 through 4 above constitute the Advanced Professional Term and must be taken concurrently.	1. EDPS 410 2. ★6 in Biological Sciences at the 300- or 400-level 3. ★9 in Mathematics at the 300- or 400-level 4. ★6 Education options 5. ★3 Non-Education options 6. ★3 Science options

Biological Sciences Major/Mathematical Sciences Minor (★150)

Core Program Requirements	Year 1 (★30)	Year 2 (★30)	Year 3 (★30)	Year 4 (★30)	Year 5 (★30)
Education: ★45 Major: ★42 Minor: ★24 100-level: ★33 (Maximum ★42) **Graduation Requirements:** GPA of 2.3 on all courses GPA of 2.7 on major courses **Area "B"** ★6 to be chosen from BIOL 315, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375, PHYS 212, 213, 261, 264, STS 200, SOC 462, WST 350 **Note:** It is the student's responsibility to ensure that all prerequisites for higher level courses are met.	1. BIOL 107, 108 2. CHEM 101, 261 (see Note) 3. ★6 junior English 4. MATH 113 or 114 5. ★3 chosen from MATH 115, 120; STAT 151 6. ★6 Arts options **Note:** Or CHEM 164 if you present a grade of 90% or higher in Chemistry 30.	1. BIOL 207, 208 2. BIOCH 200 3. CMPUT 101, 114, or 174 4. EDU 250 or ★3 Education option 5. EDPY 200 6. ★3 chosen from MATH 115, 120; STAT 151 7. ★3 in Biological Sciences at the 200-level 8. ★6 in Mathematical Sciences at the 200-level	1. EDFX 350 2. EDPS 310 3. EDPY 301 4. EDPY 303 5. EDSE 337 6. ★3 chosen from MATH 115 or 120; STAT 151 7. ★6 in Biological Sciences at the 200-level 8. ★6 Area "B" **Note:** Courses 1 through 5 above constitute the Introductory Professional Term and must be taken concurrently.	1. EDFX 450 2. EDSE 451 3. EDSE 452 4. EDSE 453 5. ★6 in Biological Sciences at the 200-, 300- or 400-level 6. ★3 in Mathematics at the 300- or 400-level 7. ★6 Education options **Note:** Courses 1 through 4 above constitute the Advanced Professional Term and must be taken concurrently.	1. EDPS 410 2. ★12 in Biological Sciences at the 300- or 400-level 3. ★3 in Mathematics at the 300- or 400-level 4. ★6 Arts options 5. ★3 Science options 6. ★3 Non-Education options

Biological Sciences Major/Physical Sciences Minor (★150)

Core Program Requirements	Year 1 (★30)	Year 2 (★30)	Year 3 (★30)	Year 4 (★30)	Year 5 (★30)
Education ★45 Major: ★42 Minor: ★24 100-level: ★36 (Maximum ★42) **Graduation Requirements:** GPA of 2.3 on all courses GPA of 2.7 on major courses **Area "A"** CHEM 211, 263, PHYS 200, 208, 271 **Area "B"** BIOL 315, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375 PHYS 212, 213, 261, 264, STS 200, SOC 462, WST 350 **Area "C"** ASTRO 320, 322, any 300-level CHEM or PHYS. **Note:** It is the student's responsibility to ensure all prerequisites for 300-level courses are met.	1. BIOL 107, 108 2. CHEM 101, 261 (see Note) 3. ★6 junior English 4. MATH 113 or 114 5. ★3 chosen from MATH 115, 120; STAT 151 6. PHYS 124, 126 or 144, 146 **Note:** Or CHEM 164 if you present a grade of 90% or higher in Chemistry 30.	1. BIOL 207, 208 2. CHEM 102 3. BIOCH 200 4. EDU 250 or ★3 Education option 5. EDPY 200 6. PHYS 224 7. ★3 in Biological Sciences at the 200-level 8. ★6 Arts options	1. EDFX 350 2. EDPS 310 3. EDPY 301 4. EDPY 303 5. EDSE 364 6. CMPUT 101, 114, or 174 7. ★6 in Biological Sciences at the 200-level 8. ★3 Area "A" 9. ★3 Area "B" **Note:** Courses 1 through 5 above constitute the Introductory Professional Term and must be taken concurrently.	1. EDFX 450 2. EDSE 451 3. EDSE 452 4. EDSE 453 5. ★6 Education options 6. ★6 in Biological Sciences at the 200-, 300- or 400-level 7. ★3 Area "C" **Note:** Courses 1 through 4 above constitute the Advanced Professional Term and must be taken concurrently.	1. EDPS 410 2. ★12 in Biological Sciences at the 300- or 400-level 3. ★6 Arts options 4. ★3 Non-Education options 5. ★3 Area "B" 6. ★3 Area "C"

Course Load Requirements

To complete the ★150 and graduate in five years, Students must take a full course load of ★30 in each Fall/Winter of the program. The minimum load for students in this specialization program is at least ★24 in each Fall/Winter. A course load of less than ★24 requires annual approval by both the Dean of Education and the Dean of Science.

Academic Standing and Graduation

The following regulations govern the combined degrees program:

(1) Continuation in the program requires a GPA of at least 2.3 on ★24 in each Fall/Winter of the five-year program.

(2) Graduation from the combined degree program requires a GPA 2.7 in the major area of concentration.

(3) Students who fail to achieve a GPA of 2.7 in their major at the end of Year 2 in the program will not be automatically transferred to the Faculty of Education.

(4) A student who fails to attain the standard necessary for continuation

or graduation may appeal to be granted one Fall/Winter to achieve the required standing.

(5) A student who cannot attain the standard necessary for continuation or graduation in the combined degrees program will be required to withdraw from the program. In so doing, the student may apply to transfer to the General BSc program in the Faculty of Science or the BEd program in the Faculty of Education, provided they meet the continuation GPA of 2.0.

(6) Normally, a student transferring from the combined degrees program to a BEd program after Year 2 or 3 should be able to complete the degree in one or two years. However, transfer to the BSc program must be made after Year 2 at the latest to avoid loss of credit.

(7) BSc Specialization degrees with Distinction are awarded when students achieve a GPA of at least 3.5 on the last ★60 if the student was enrolled in at least (★24) during each Fall/Winter of the last two years.

Residence Requirement

A student transferring into the combined degrees program with transfer credit normally will be required to complete at least ★90 (normally the last ★90) while registered in the combined program.

Time Limits for Completion of Program

The combined degrees program is a five-year program. A student may complete the requirements of the combined degree over a period longer than five years or meet the requirements in a shorter time by attending Spring/Summer. An extension beyond six years is not recommended and requires the written approval of the Faculty of Science and the Faculty of Education.

193.1.7 The BSc After a BSc from the Faculty of Science at the University of Alberta

An applicant holding a BSc degree from this Faculty may qualify for a second degree by completing a minimum of an additional ★30 subject to the following provisions.

(1) All admission, program, academic standing and graduation requirements of the second degree program must be met. Admission to a BSc Honors or Specialization program as a second degree requires the approval of the appropriate Department(s) and the Faculty Office.

(2) A graduate holding a BSc General degree from this Faculty may qualify for a second BSc General degree provided the major in the second degree is not the same as either the major or minor in the first degree. The only exception is that students who wish to upgrade their previous minor to be the major in their second degree may do so. However, their original minor must have been in Science and the new minor cannot overlap either the major or minor of their previous degree. At least 9 senior units of the major and at least 6 senior units of the minor for the second degree must be completed while registered in the second degree program.

Students must declare a major and minor on application to the program. Students must follow the program to which they have been admitted and must achieve a GPA of 2.3 or higher in their major, in each Fall/Winter period, to be able to continue in good standing. Subsequent changes in major or minor may be possible according to merit.

(3) A graduate holding a BSc General degree may qualify for a BSc Specialization or BSc Honors degree by completing a minimum of ★30. The specific course requirements for a BSc Specialization or BSc Honors degree as a second degree are determined at the time of admission by the appropriate Department(s) and the Faculty Office. At least 15 senior units in the subject discipline of the degree must be completed while registered in the second degree program.

(4) A graduate holding a BSc Specialization or BSc Honors degree from this Faculty may qualify for a second BSc Specialization or Honors degree provided the second degree is in a different subject or area.

(5) Students in a second degree program must maintain satisfactory standing in each Fall/Winter. Such students in a second degree program who do not maintain satisfactory standing will be required to withdraw and will not be eligible for Academic Warning or Probation.

193.1.8 The BSc After an Undergraduate Degree (Other than a BSc from the Faculty of Science at the University of Alberta)

An applicant holding an undergraduate degree from another Faculty at the University of Alberta or from another university may qualify for the BSc General degree, a BSc Specialization degree, or a BSc Honors degree by meeting the following requirements:

(1) Students who present the equivalent of a BSc General or other undergraduate degree from another institution may complete a BSc General degree, as a second degree, from this Faculty provided the major in the second degree is not the same as either the major or minor in the first degree. The only exception is that students who wish to upgrade their previous minor to be the major in their second degree may do so. However, their original minor must have been in Science and the new minor cannot overlap either the major or minor of their previous degree. Students must declare a major and minor on application to the program.

(2) Students who present the equivalent of a BSc Honors or Specialization degree from another institution may complete a second BSc Honors or Specialization degree, in a different discipline, from this Faculty.

(3) Satisfactorily complete a minimum of an additional ★60 while registered at the University of Alberta with at least ★30 while registered in the Faculty of Science second degree program.

(4) For students completing a BSc General After degree, at least 18 senior units in the student's major and at least 12 senior units in the student's chosen minor must be completed while registered in the After Degree program in the Faculty of Science at the University of Alberta.

(5) In the BSc Specialization or Honors After Degree, at least 24 senior units of the course requirements in the subject discipline of the degree must be completed while registered in the After Degree program in the Faculty of Science at the University of Alberta.

(6) Satisfy all admission requirements (see §15.15), as well as program, academic standing, and graduation requirements of the particular degree program (See §193.1.1 for Honors, §193.1.2 for Specialization, and §193.1.3 for General Program.)

(7) Admission to a Specialization program and an Honors program requires approval of the appropriate Department and the Faculty Office. The specific course requirements for a degree program are determined, at the time of admission, by the appropriate Department (for Specialization and Honors) and the Faculty Office. For further information, consult the Faculty of Science Student Services Office.

193.1.9 Industrial Internship Program

The Industrial Internship program (IIP) offers undergraduate students extended work experience in industry in addition to their academic courses. The work experience is normally undertaken after completion of a minimum of 75, and not more than 105, units of course weight of an Honors or Specialization degree program. Students who have maintained good academic standing in an Honors or Specialization program are eligible for the program. Department IIP Advisors will provide approved position descriptions from companies wishing to employ IIP students. Companies are responsible for interviewing and selecting students for the positions. The internship may begin in May, September or January and must be of at least 8 months duration, but may extend to up to 16 months; a 16-month internship normally includes a four-month probationary period. Work during the internship period is full time, for which the student is paid by the employer at competitive rates. The student, employer and the department must agree to terms of the internship. Following completion of the work experience, students return to the university to complete their degree program of studies. It is not possible to guarantee that all students wishing to obtain an internship will be able to do so.

During the period of the internship, the student registers in a work experience (WKEXP) course each term and is considered a full-time student at the University of Alberta. Work experience courses are assigned no units of course weight and are graded credit/no credit. All students must register in a minimum of two WKEXP courses that have associated fees. These fees are used to cover Department costs of job recruitment, supervision and site visits during the internship period, and program administration costs.

During the first term following completion of the internship and return to the university, students must complete the academic requirements of the Industrial Internship. This normally takes the form of a report to the appropriate Advisor and/or Committee as well as to other students as part of a graded seminar course.

Detailed information about the Industrial Internship is available from the IIP Advisor in each Department in the Faculty of Science.

193.1.10 Transfers Between Programs

A student may transfer from an Honors program to either the corresponding Specialization program or to the General program, or from a Specialization program to the General program at any time in the program, by submitting a readmission form to the Faculty Office subject to appropriate deadlines.

Transfers from the General program to a Specialization program or an Honors program or from one Specialization program to another or to an Honors program may be made according to the dates listed in §12. Also, transfers to Honors and Specialization programs require approval of the Department responsible for the new program.

Note that transfer from BSc/BEd program to any of the BSc programs must take place no later than Year 2 to avoid loss of credit.

193.1.11 Completion of a BSc Degree After Transfer to Another Faculty

Students who transfer to another Faculty after completing part of a BSc program may reapply to the Faculty of Science after completing the degree from the other Faculty. A former student transferring to the Faculty of Science normally must complete at least ★60 while registered in the Faculty of Science at the University. Courses completed in the Faculty of Science before transfer may count toward the minimum ★60 that must be completed while registered in the Faculty of Science. Science or Arts courses taken while in another Faculty, which are clearly noted as "extra-to-degree" on the transcript, may fulfil specific subject requirements of a degree program in Science but will not fulfil the minimum residence requirement of the program.

193.2 Biochemistry

193.2.1 Honors in Biochemistry

Continuation, or graduation, in the Honors program in Biochemistry requires a minimum GPA of 3.3 on at least ★30 in each Fall/Winter period credited towards the degree.

Year 1

BIOL 107, 108
CHEM 101, 102 and 261 (or 164)
MATH 113 (or 114), and 115
PHYS 124 or equivalent
★6 in junior-level ENGL

Year 2

BIOCH 200 (Fall), and BIOCH 320, 330 (Winter)
CHEM 211, 213, 263
PHYS 126 or equivalent
★6 in approved Science options
★3 in an approved Arts option

Year 3

BIOCH 310 (Fall), and BIOCH 401
★6 in senior-level BIOCH courses
CHEM 371, 373
★3 in an approved Science option
★6 in approved Arts options

Year 4

★9 in senior-level BIOCH courses
BIOCH 499
★6 in 300- or 400-level CHEM
★6 in approved Science options
★3 in an approved Arts option

Notes

(1) Students must receive a grade of not less than B- in all Biochemistry courses credited toward the minimum number required for the degree.
(2) Students should consult the Department of Biochemistry regarding selecting options throughout the course of the program.
(3) Recommended science options for second year include BIOL 207; MICRB 265; MATH 214 and 215; GENET 270 and 275; PHYSL 210 or 211; PMCOL 201; STAT 141 or 151.
(4) Recommended science options for third and fourth year include BIOCH 450, 455, and 460; MICRB 311 or 415; PHYSL 210 or 211; IMIN 200; PMCOL 305; and BIOL 380.

193.2.2 Specialization in Biochemistry

Continuation, or graduation, in the Specialization program in Biochemistry requires a minimum GPA of 2.7 in each Fall/Winter period credited towards the degree.

Year 1

BIOL 107, 108
CHEM 101, 102 and 261 (or 164)
MATH 113 (or 114), 115
PHYS 124 or equivalent
★6 junior-level ENGL

Year 2

BIOCH 200 (Fall), and BIOCH 320, 330 (Winter)
CHEM 211, 213, 263
PHYS 126 or equivalent
★3 in an approved Arts option
★6 in approved Science options

Year 3

BIOCH 310 (Fall), BIOCH 401
★6 in senior-level BIOCH courses
★6 in approved Mathematical or Physical Science options
★3 in an approved Science option
★6 in approved Arts options

Year 4

★6 in senior-level BIOCH courses
★15 in approved Science options
★3 in an approved arts option
★6 in approved options

Notes

(1) Students must receive a grade of not less than B- in BIOCH 200, 310, 320, and 330 and C in all other BIOCH courses credited toward the minimum number required for the degree.
(2) Students should consult the Department of Biochemistry regarding selecting options throughout the course of the program.
(3) Recommended science options for second year include BIOL 207; MICRB 265; GENET 270 and 275; PHYSL 210 or 211; PMCOL 201.
(4) Recommended mathematical or physical science options include MATH 214 and 215; CHEM 371 and 373; PHYS 212 and 213; STAT 141 or 151; or approved CMPUT courses.
(5) Recommended science options for third and fourth year include BIOCH 450, 455, and 460; MICRB 311 or 415; PHYSL 210 or 211; IMIN 200; PMCOL 305; and BIOL 380.

193.3 Biological Sciences

All students in Honors and Specialization programs in Biological Science take a common core of four BIOL courses in the first and second years. Thereafter, they follow the course sequence of one of the areas of concentration in either Honors or Specialization in Biological Sciences identified in §193.3.4 Students must declare an area of concentration and follow the appropriate course sequence. The title of the area of concentration will appear on their degree. Additional course requirements for Honors students include BIOL 499 and program specific courses. BIOL 499, a directed research project, must be conducted on a topic appropriate to the student's area of concentration. BIOL 499 is a recommended option for Specialization students.

Streams have been developed within several programs in Biological Sciences. These are lists of courses that provide guidance to students wishing to focus further on specific areas of Biology. Students in a program are not required to declare or follow a stream, and stream designations do not appear on transcripts. On the Course Sequence chart, available streams are noted under Years 3 and 4. Streams are described in full on the Department of Biological Sciences website. Students should consult with advisors in choosing and following streams within their programs.

Students may receive block Transfer in the Biological Sciences at the University of Calgary or the University of Lethbridge if the appropriate courses are completed. Interested students may contact the Department of Biological Sciences for details.

193.3.1 Honors in Biological Sciences (including Bioinformatics)

Admission to the BSc Honors in Biological Sciences program see Admission Chart 5, §15.15.

Continuation in the Honors Biological Sciences program requires a minimum GPA of 3.0 in the preceding Fall/Winter. Graduation requires a minimum GPA of 3.0 on the last ★60 credited to the degree. Students in Honors programs must take at least ★24 during the Fall/Winter of each year of the program. Exceptions to this requirement must be approved by the Department and the Faculty Office.

193.3.2 Specialization in Biological Sciences

Admission to the BSc Specialization in Biological Sciences program see Admission Chart 5, §15.15.

Continuation in the Specialization program requires a GPA of 2.3 in the preceding Fall/Winter. Graduation requires a minimum GPA of 2.3 on all courses credited to the degree.

193.3.3 First-Year Core for BSc Honors and Specialization in Biological Sciences

The following courses are common to all programs:

BIOL 107, 108; CHEM 101, 164 or 261; MATH 113 or 114 or 120; STAT 151; ★6 in Arts options (English recommended); ★6 in program-specific courses (see individual programs for requirements and recommendations).

193.3.4 Course Sequence in Biological Sciences

See Science Chart 2.

193.3.5 Industrial Internship Program

An Industrial Internship Program, similar to a co-op program, is offered to students in the Specialization or Honors programs in Biological Sciences (see §193.1.9 for guidelines to the program). The Industrial Internship designation will appear on the degree parchments of students who have participated in the program.

Students approved to enter this stream register for a continuous sequence of Science Work Experience courses (WKEXP 955, 956, 957, 958), starting in May, September or January. During the program, students are considered full-time students of the University. Work experience courses have no weight and are

Science Chart 2 Course Sequence in Biological Sciences

Animal Biology

Year 1	Year 2	Year 3 and 4
BIOL 107, 108; CHEM 101, 164 or 261; MATH 113 or 114 or 120; STAT 151 ★6 Arts options (English recommended) ★6 Science options	BIOCH 200; BIOL 201 or CELL 201; BIOL 207, 208; ZOOL 224; ZOOL 250 or ENT 220; ZOOL 241 or 242 ★6 approved options ★3 Arts options	BIOL 321; BIOL 331 or 332; ENT 220 or ZOOL 250 or 352; GENET 270 or 275 or 390; ENT 302 or ZOOL 303; ZOOL 325; ZOOL 370 or 371 ★9 Arts options ★15 from List A ★3 from List B ★12 approved options (including additional courses from List A or B) List A: BIOL 330, 331, 332, 335, 361, 380, 400, 430, 490, 495, 498, 499; EAS 230; ENT 207, 220, 302, 321, 378, 380, 392, 427; MA SC 410, 412, 430, 440; PALEO 418, 419; ZOOL 241, 242, 250, 303, 340, 342, 343, 351, 352, 354, 370, 371, 405, 407, 408, 452. List B: BIOL 433, 468, 495 (if appropriate topic); ENT 401; MA SC 480; ZOOL 402, 441, 442, 472. Available streams include: entomology, marine biology, parasitology and vertebrate biology. **Notes:** (1) MA SC courses on this list are offered at Bamfield Marine Sciences Centre. (2) Honors students are required to take BIOL 499 and reduce approved options by ★6.

Bioinformatics Specialization

Year 1	Year 2	Year 3 and 4
BIOL 107, 108; CHEM 101, 102, 164 or 261; ★6 Arts options (English recommended) One set from the following 3 sets of courses: 1. CMPUT 101, 114, 115 (CMPUT 101 and 114 concurrently) **OR** 2. CMPUT 114 and 115 and ★3 in a Science option **OR** 3. CMPUT 174, 175 and ★3 in a Science option	BIOCH 200; BIOL 207, 208; CHEM 263; CMPUT 201, 291; GENET 270; MATH 113 or 114 or 117; MATH 120 or 125; STAT 151 **Note:** GENET 270 may be taken in Year 3	One of BIOCH 310, 320, 330 BIOIN 301, 401; CMPUT 204, 272, 301 ★6 in GENET 275, 301, 302, 304 or 390 ★12 Arts options ★3 CMPUT from recommended options below ★21 Science options Recommended options include, but are not restricted to additional courses from above and the following: BIOCH 310, 320, 330, 420; BIOL 321, 380, 391, 400, 490, 495, 498, 499 520; CMPUT 229, 304, 325, 340, 366, 379, 391, 466, 474, 495; GENET 275, 301, 302, 304, 390; IMIN 200; MICRB 265, 316; STAT 221, 222, 337. **Notes:** (1) First-year core Math and Stats courses are taken in Year 2. (2) Honors students are required to take BIOL 499 and reduce Science options by ★6.

Ecology

Year 1	Year 2	Year 3 and 4
BIOL 107, 108; CHEM 101, 164 or 261; MATH 113 or 114 or 120; STAT 151 ★6 Arts options (English recommended) ★6 Science options (EAS 100 recommended)	BIOCH 200; BIOL 207, 208; BOT 205; MICRB 265; ZOOL 224 or 325; ZOOL 250 or ENT 220 ★9 in an Arts option	BIOL 321, 330 ★12 from BIOL 331, 332, 340; BOT 332; ZOOL 371 ★3 from BIOL 380; BOT 303, 340; ENT 302, 321; GENET 270, 275; IMIN 200; MICRB 311; ZOOL 241, 242, 303 ★6 from BOT 306, 310, 314, 321, 322, 330; ENT 427; ZOOL 351, 352, 405, 407, 408 ★9 from BIOL 333, 361, 364, 366, 367, 381, 430, 433, 450, 464, 468, 470, 498, 499; BOT 384; MICRB 491; ZOOL 340, 354, 370, 472 ★3 Arts option ★18 approved options ★3 from BIOL 365, 432; MA SC 4XX, ZOOL 434 Available streams include: conservation/wildlife biology, freshwater biology, and plant ecology. **Notes:** (1) MA SC courses on this list are offered at Bamfield Marine Sciences Centre. (2) Honors students are required to take BIOL 430 and 499 and reduce approved options by ★9.

Science Chart 2 Course Sequence in Biological Sciences (cont'd)

Evolutionary Biology

Year 1	Year 2	Year 3 and 4
BIOL 107, 108; CHEM 101, 164 or 261; MATH 113 or 114 or 120; STAT 151 ★6 Arts options (English recommended) ★6 Science options	BIOCH 200; BIOL 207, 208, 321 ★6 from BOT 205, 210; ENT 207, 220, 380; MICRB 265; ZOOL 224, 250 ★3 from BOT 340; ENT 321; ZOOL 241, 242 ★3 Arts option ★6 approved options	BIOL 335, 380, 392 ★3 from BOT 411; PALEO 418, 419 ★3 from BIOL 331, 332; BOT 332 ★3 from GENET 270, 275, 390 ★6 from BOT 306, 310, 314, 321; ENT 427; ZOOL 325, 405, 407, 408 ★9 Arts options ★12 approved options ★15 from list below Recommended options include, but are not restricted to additional courses from above, and the list below: BIOL 400, 421, 430, 433, 450, 490, 495, 498, 499; BOT 303, 308, 322, 330, 350, 506, 511; EAS 100, 105, 230; ENT 302; GENET 270; MA SC 410, 412, 420, 430, 440, 445; PALEO 414; ZOOL 303, 340, 351, 352, 354, 371, 402, 434, 472 **Notes:** (1) Marine Science courses on this list are offered at Bamfield Marine Sciences Centre. (2) Honors students are required to take BIOL 499 and reduce approved options by ★6.

Microbiology

Year 1	Year 2	Year 3 and 4
BIOL 107, 108; CHEM 101, 102, 164 or 261; MATH 113 or 114 or 120; STAT 151 ★6 Arts options (English recommended) ★3 Science options	BIOCH 200; BIOL 207, 208; CHEM 263; GENET 270; IMIN 200; MICRB 265 ★3 in Science options ★6 in Arts options **Notes:** (1) A minimum grade of B- is required in MICRB 265 and 311 to stay in Microbiology Honors program. (2) BIOL 201 highly recommended in Year 2.	BIOL 201, 391; CHEM 211, 213; GENET 390; MICRB 311 ★6 in Arts options ★15 in Microbiology options (List A) ★9 in Science options (List A or B) ★12 in Approved options (List A, B or C) Recommended options include, but are not restricted to the following: List A: Microbiology options: IMIN 324, 371, 372, 452; MICRB 316, 343, 345, 410, 415, 450, 491, 492; NU FS 361, 363, 402, 480; MMI 351, 352, 405, 415, 520. List B: Science options: BIOCH 310, 320, 330, 401, 410, 420, 430, 441, 450, 455, 460; BIOIN 301; BIOL 400, 490, 495, 498, 499; BOT 306; CHEM 303, 361, 363, 371, 373; CMPUT 101, 114, 115, 174, 175; ENT 378; GENET 275, 301, 302, 304, 375, 408, 420; IMIN 401; PHYS 124, 126; ZOOL 352, 452. List C: Approved options: BIOL 380; BOT 205, 380, 382; CELL 300, 301; EAS 201; PHYSL 210; PSYCO 104; SOILS 210, 430. **Note:** Honors students are required to take BIOL 499, MICRB 343 and 345 and reduce the number of Science and Microbiology options each by ★6.

Molecular Genetics

Year 1	Year 2	Year 3 and 4
BIOL 107, 108, 207; CHEM 101, 102, 164 or 261; MATH 113 or 114 or 120; STAT 151 ★6 Arts options (English recommended) **Note:** Although BIOL 207 is recommended in Year 1, alternatively, BIOL 201 (or CELL 201) may be taken in Year 1. BIOL 207 must be completed before Winter term of Year 2.	BIOCH 200; BIOL 201 or CELL 201; BIOL 208; CHEM 263; GENET 270, 275; MICRB 265 ★6 Arts options ★3 Science option **Note:** GENET 270 and 275 must be taken during Year 2 to permit completion of the program in four years.	One of BIOCH 310, 320, 330 or CELL 300 (BIOCH 320 strongly recommended) BIOL 380; GENET 301, 302, 304, 390 ★9 from List A ★3 from List B ★12 from List C ★6 in Arts options ★12 in approved options List A: GENET 364, 408, 412, 418. List B: BIOL 391; GENET 375, 420. List C: Including, but not restricted to, courses from List A and B that exceed ★9 and ★3, respectively, and the following: ANAT 400; BIOCH 310, 320, 330, 401, 410, 420, 430, 450; BIOL 315, 321, 400, 490, 495, 498, 499; BOT 303, 350, 382, 445; CELL 300, 301, 402, 415, 445; CHEM 371, 373; ENT 302, 321; GENET 422; IMIN 200, 324, 371, 401; MICRB 311, 316, 343, 345, 415; PHYSL 210, 401; ZOOL, 241, 242, 303, 340, 342, 402, 441, 442. **Notes:** (1) Honors students are required to take BIOL 499 and reduce approved options by ★6. (2) More than ★12 total may be chosen from List A and List B, and the extra credits may be used toward ★12 from List C or toward ★12 in approved options or both.

Science Chart 2 Course Sequence in Biological Sciences (cont'd)

Physiology and Developmental Biology

Year 1	Year 2	Year 3 and 4
BIOL 107, 108; CHEM 101, 164 or 261; MATH 113 or 114 or 120; STAT 151 ★6 Arts options (English recommended) ★6 Science options	BIOCH 200; BIOL 201 or CELL 201; BIOL 207, 208; ZOOL 241, 242, 250 ★3 Arts option ★6 approved options **Note:** students intending to take BIOCH 310, 320 or 330 are required to take CHEM 263	ZOOL 303, 325, 344 ★3 from ZOOL 402, 441, 442 or BIOL 545 ★3 from BIOCH 310, 320, 330 or CELL 300 ★9 from ZOOL 340, 342, 343, 352 or BIOL 391 ★9 Arts options ★12 approved options ★15 from list below Recommended options include, but are not restricted to additional courses from above and the following: BIOCH 310, 320, 330; BIOL 391, 400, 490, 495, 498, 499, 545; BOT 303, 340, 350, 403, 445; CELL 300, 301, 402, 415; ENT 302, 321, 378; GENET 270, 301, 302, 304, 375, 390, 412, 418, 420; IMIN 200, 371, 372, 401, 452; MA SC 403, 415; MICRB 265, 311; NEURO 443, 472; PHYSL 372, 401, 402, 403, 404, 544, 545; PMCOL 371; ZOOL 340, 342, 343, 352, 370, 402, 441, 442, 452. **Notes:** (1) MA SC courses on this list are offered at Bamfield Marine Sciences Centre. (2) Honors students are required to take BIOL 499 and reduce approved options by ★6. (3) The above program is distinct from the Honors Physiology Program offered by the Department of Physiology, Faculty of Medicine and Dentistry. Applicants should contact the current Advisor in the Department of Biological Sciences to ensure that this is the Program for which they wish to register.

Plant Biology

Year 1	Year 2	Year 3 and 4
BIOL 107, 108; CHEM 101, 164 or 261; MATH 113 or 114 or 120; STAT 151 ★6 Arts options (English recommended) ★6 Science options	BIOCH 200; BIOL 201, 207, 208, 321; BOT 205, 210; CHEM 102 ★3 Arts option ★3 approved option	BOT 308, 321, 332, 340; MICRB 265 ★3 from GENET 270, 275, 364, or 390 ★9 Arts options ★33 from the list below Approved options include, but are not restricted to the following: BIOL 330, 333, 335, 340, 364, 367, 400, 430, 433, 470, 490, 495, 498, 499; BOT 303, 306, 314, 322, 330, 340, 350, 380, 382, 403, 411, 445, 506, 511, 545; FOR 372; GENET 364; PL SC 335, 355, 380, 385, 465; REN R 421, 468. **Note:** Honors students are required to take BIOL 499 and reduce approved options by ★6. Honors students are required to take one of the following discussion courses and reduce approved options by ★3: BOT 403, BOT 445, BOT 506, BOT 511, BOT 545, or BIOL 495 (if appropriate topic).

graded credit/no credit, and recorded on the student's transcript. The Industrial Internship Program Advisor maintains contact at approximately three-month intervals with the student and the person designated by the employer to be responsible for the student's progress. This arrangement ensures satisfaction on all sides. If the review shows the situation is not satisfactory, the internship may be terminated and the student would then return to classes at the next available opportunity. The graduation requirements for the Industrial Internship program designation include successful completion of at least WKEXP 955 and 956 plus BIOL 400. BIOL 400 must be taken in the first term immediately following completion of the WKEXP period. If required by the employer, the student's written report and oral presentation in BIOL 400 may be classified confidential. The employer also assesses the student's performance during the work term. Based on the student's written report and oral presentation, and the report from the employer, students are awarded a grade in BIOL 400.

Interested students should see the Industrial Internship Advisor in the Department of Biological Sciences for more information.

193.3.6 General Program in Biological Sciences

A major or a minor area of concentration in the Biological Sciences is available in the BSc General program.

Courses which may be used toward a Biological Sciences major or minor include BIOIN; BIOL; BOT; CELL, ENT; GENET; IMIN; MA SC; MICRB; NEURO; PALEO; and ZOOL. See §§194.3, 194.5, 194.6, 194.7 and 194.8 for additional courses that may be used toward a Biological Sciences major or minor.

Courses in Biochemistry (see §194.3) may be used for a concentration in Biological Sciences or Physical Sciences or Chemistry but not in more than one concentration.

Courses in Paleontology may be used in a concentration in Biological Sciences or Earth and Atmospheric Sciences but not in both.

Courses in Bioinformatics may be used in a concentration in Biological Sciences or Mathematical Sciences or a Computing Sciences minor but not in more than one concentration.

Note: Effective September 1996, it is not possible to combine a major or minor in the Biological Sciences with a minor or major in one of the specific subject disciplines in the Biological Sciences. For example, students may not select a major in the Biological Sciences and a minor in Microbiology.

193.4 Cell Biology

193.4.1 Honors in Cell Biology

Continuation, or graduation, in the Honors Cell Biology program requires a minimum GPA of 3.0 on at least ★24 in each Fall/Winter period credited to the degree.

Year 1

BIOL 107, 108
CHEM 101, 102
CHEM 164 or 261
MATH 113 or 114, and 115
STAT 141 or 151
★6 in an Arts option (11x English recommended)

Year 2

BIOCH 200
BIOL 207
CELL 201 or BIOL 201
CHEM 263
GENET 270
MICRB 265
PHYS 124, 126
★3 in an Arts option
★3 from Cell Biology approved Science options

Year 3

CELL 300, 301
CHEM 371
★3 from BIOCH 310, 320 or 330
★6 from Group A Cell Biology options
★6 from Cell Biology approved Science options
★6 in Arts options

Year 4

CELL 405 or 445, 499
★6 from Group A Cell Biology options
★12 from Cell Biology approved Science options
★3 in an Arts option

Notes:

(1) Students are required to consult the Department of Cell Biology for selection and approval of options.
(2) Students are encouraged to select options from the Cell Biology approved Science options list, but may also follow a course of study tailored to their interests.

Group A: Cell Biology Options

BIOCH 420, 441, 450, 481, 482
BIOCH 430 or GENET 304
BIOL 421
CELL 310, 398, 402, 405, 410, 415, 425, 445, 498
GENET 375, 420
IMIN 200, 324, 452
MICRB 316
ONCOL 320
PMCOL 371 or ZOOL 342
ZOOL 303 or BOT 303

Cell Biology Approved Science Options

ANAT 200
BIOCH 310, 320, 330, 401, 410, 455
BIOL 208, 315, 321, 335, 391, 430
BOT 303, 382
CHEM 282, 373
GENET 275, 301, 302, 364, 390, 408, 412
IMIN 371, 372, 401
MICRB 311, 410
PHYSL 210, 401
STAT 337
ZOOL 242, 342

193.4.2 Specialization in Cell Biology

Continuation, or graduation, in the Specialization Cell Biology program requires a minimum GPA of 2.7 on at least ★24 in each Fall/Winter period credited to the degree.

Year 1

BIOL 107, 108
CHEM 101, 102
CHEM 164 or 261
MATH 113 or 114, and 115
STAT 141 or 151
★6 in an Arts option (11x English recommended)

Year 2

BIOCH 200
BIOL 207
CELL 201 or BIOL 201
CHEM 263
GENET 270
MICRB 265
PHYS 124, 126
★3 in an Arts option
★3 from Cell Biology approved Science options

Year 3

CELL 300, 301
★3 from BIOCH 310, 320 or 330
★6 from Group A Cell Biology options
★9 from Cell Biology approved Science options
★6 in Arts options

Year 4

★3 from a 400-level CELL course
★9 from Group A Cell Biology options
★15 from Cell Biology approved Science options
★3 in an Arts option

Notes:

(1) Students are required to consult the Department of Cell Biology for selection and approval of options.
(2) Students are encouraged to select options from the Cell Biology approved Science options list, but may also follow a course of study tailored to their interests.

Group A Cell Biology Options:

BIOCH 420, 441, 450, 481, 482
BIOCH 430 or GENET 304
BIOL 421
CELL 310, 398, 402, 405, 410, 415, 425, 445, 498, 499
CHEM 371
GENET 375, 420
IMIN 200, 324, 452
MICRB 316
ONCOL 320
PMCOL 371 or ZOOL 342
ZOOL 303 or BOT 303

Cell Biology Approved Science Options:

ANAT 200
BIOCH 310, 320, 330, 401, 410, 455
BIOL 208, 315, 321, 335, 391, 430
BOT 303, 382
CHEM 282, 373
GENET 275, 301, 302, 364, 390, 408, 412
IMIN 371, 372, 401
MICRB 311, 410
PHYSL 210, 401
STAT 337
ZOOL 242, 342

193.5 Chemistry

193.5.1 Honors in Chemistry

Honors students in Chemistry must take a core of Chemistry and auxiliary courses. The core consists of ★45 in Chemistry courses, ★12 in Mathematics courses, ★6 in Physics courses, ★3 in Biology or Biochemistry courses, ★3 in either CHEM 400 or 401, ★6 in a junior English or ★3 in English and ★3 in Arts option, and ★12 in Arts options. In addition to the core courses, honors students must complete at least ★18 in senior courses in Chemistry from the courses listed below. Finally, the honors student must include ★15 in options in the third and fourth years of the program. These are normally chosen from offerings within the Faculty of Science. All options must be selected in consultation with the Department of Chemistry.

Continuation in the Honors Chemistry program requires a GPA of 3.0 on at least ★24 in the preceding Fall/Winter.

The Honors Chemistry degree is accredited by the Canadian Society for Chemistry.

Year 1

CHEM 101, 102, 261 (or 164)
MATH 113 (or 114), 115
PHYS 144, 146
a junior course in English or ★3 in English and ★3 in an Arts option
★3 in Science option

Year 2

CHEM 211, 241, 243, 263, 282, 298
MATH 214 and either 120 or 125 or 215 or STAT 151 (if PHYS 124 and 126 are taken in Year 1, then PHYS 230 or 281 is also required)
★6 in Arts options

Years 3 and 4

CHEM 313, 361, 363, 371, 373, 398
BIOCH 200 or BIOL 107
CHEM 400 or CHEM 401
★18 in senior chemistry courses
★12 in Science options
★6 in Arts options

Senior Courses in Chemistry

BIOCH 200, 310, 320, 330
CHEM 303, 305, 333, 400 (if not taken as a requirement), 401 (if not taken as a requirement), 403, 405, 413, 415, 417, 419, 421, 427, 434, 436, 437, 438, 439, 444, 461, 462, 463, 477, 479, 483, 489, 493, 495

193.5.2 Specialization in Chemistry

The complete Specialization program consists of ★120 and must include CHEM 101, 102, 261 (or 164), 211, 241, 243, 263, 282, 298, 313, 361, 371, 373, 398; MATH 113 (or 114), 115, 214, and either 120 or 125 or 215 or STAT 151; PHYS 144, 146 (if PHYS 124 and 126 are taken in Year 1, then PHYS 230 or 281 is also required); BIOCH 200 or BIOL 107; ★6 in junior English or ★3 in English and ★3 in an Arts option,★9 in senior Chemistry options, ★12 in Arts options, and ★30 in approved options. These options are normally chosen from within the Faculty of Science. All options must be selected in consultation with the Department of Chemistry. The honors curriculum can be used as a guide in planning a specialization program.

Continuation in the Specialization in Chemistry program requires the successful completion of at least ★18 in each preceding Fall/Winter with a GPA of 2.3 and a GPA of 2.3 on all Chemistry courses. Graduation requires a minimum GPA of 2.3 on the last ★90 credited to the degree.

The Specialization Chemistry degree is accredited by the Canadian Society for Chemistry.

193.5.3 Industrial Internship Program

An Industrial Internship Program, similar to a co-op program, is offered to students in the Specialization or Honors programs in Chemistry (see §193.1.9 for guidelines to the program). The Industrial Internship designation will appear on the degree parchments of students who have participated in the program.

Students approved to enter this stream register for a continuous sequence of Science Work Experience courses (WKEXP 955, 956, 957, 958), starting in May, September, or January. During the program, students are considered full-time students of the University. Work experience courses have no weight and are graded credit/no credit, and recorded on the student's transcript. The Industrial Internship Program Advisor maintains contact at approximately three-month intervals with the student and the person designated by the employer to be responsible for the student's progress. This arrangement ensures satisfaction on all sides. If the review shows the situation is not satisfactory, the internship may be terminated and the student would then return to classes at the next available opportunity. The graduation requirements for the Industrial Internship program designation include successful completion of at least WKEXP 955 and 956, plus CHEM 400. CHEM 400 must be taken in the first term immediately following completion of the WKEXP period. If required by the employer, the student's written report and oral presentation in CHEM 400 may be classified confidential. The employer also assesses the student's performance during the work term. Based on the student's written report and oral presentation, and the report from the employer, students are awarded a grade in CHEM 400.

Interested students should see the Industrial Internship Advisor in the Department of Chemistry for more information.

193.5.4 Concentration in Chemistry

Students in the BSc General program with a major in Chemistry should complete CHEM 101, 102, 261 (or 164), 263; MATH 113 (or 114), 115, and ★6 of junior physics during the first two years of their programs. CHEM 101, 102, MATH 113 (or 114) and 115 should be taken in Year 1 because these provide maximum flexibility for course selection in Year 2 and subsequent years of the program. To complete a major in Chemistry, students should select from the following senior courses: CHEM 211, 213, 241, 282, 333, 361, 363, 371 and 313. Students majoring in Chemistry should consult the Chemistry Department Advisor before registering in second and later years of the program to plan a course of study and have their programs approved by the Advisor.

Students in the BSc General program with a minor in Chemistry should include CHEM 101, 102, 261 (or 164), and 263 in their program. Other Chemistry courses to complete the minor may be selected from CHEM 211, 213, 282, 303, 313, 333, 361, 363, and 371.

193.6 Computing Science

For admission requirements, see §15.15.

There are many routes to the study of Computing Science. Students should visit our website at www.cs.ualberta.ca. Each student is expected to develop their program of study in consultation with an advisor. All Honors and Specialization programs require annual approval by the department.

193.6.1 Honors in Computing Science

The Honors program is directed to highly-motivated students with exceptional ability. It provides the opportunity for students to design their program for in-depth study of topics of interest. The Honors program has few specified requirements. Honors students must complete a minimum number of upper level courses (300-level or greater). This implies that they must take the required prerequisites in CMPUT, MATH, and other subjects. There is no set of required 200-level courses, and prerequisites in CMPUT courses can be waived for demonstrated competence in the subject. Programs that cross discipline and faculty boundaries are possible and encouraged.

Because the Honors program is very flexible, all students must obtain departmental guidance in developing their program. All course selections and changes require annual approval by a departmental advisor.

Honors students should keep in mind the degree requirements for Specialization in case they can no longer continue in Honors.

Continuation in the Honors program requires successful completion of at least ★24 in the previous Fall/Winter with a GPA of 3.0, and a GPA of 3.0 on all CMPUT courses taken in that Fall/Winter. Most scholarships require a full course load of ★30 to be eligible for consideration.

Graduation requires a GPA of 3.0 on the last ★60 credited to the degree, and 3.0 on all CMPUT courses credited to the degree.

Honors students must complete a minimum of ★24 in CMPUT courses at the 300- or 400-level or greater offered at the University of Alberta.

The course requirements for Honors in Computing Science are:

★6 CMPUT 174, 175 (Honors sections if offered), taken in Year 1
★6 in junior English, taken in Year 1
★30 in CMPUT at the 300-level, or higher, with a minimum of ★12 at 400-level or higher. Allowed courses include individual study topics courses, and graduate courses at the 500- and 600- level.
★36 Science options
★12 Arts options
★30 in options from Science, Arts, or another Faculty.

Students can take a maximum of ★42 in 100-level courses.

Each Fall and Winter term throughout their program, all Honors students must register in the Honors seminar CMPUT 495 (★0, 1hr/week). This seminar provides honors students with the opportunity to interact with faculty members and honors students from all years of the program to explore topics of interest..

193.6.2 Specialization in Computing Science

The Specialization in Computing Science program is designed for students to pursue the concentrated study of Computing Science, or to combine the study of Computing Science with another discipline. Students should consider the Industrial Internship Program.

Continuation in the program requires a minimum 2.3 GPA on at least ★18 in the preceding Fall/Winter, and a minimum 2.3 GPA on all CMPUT courses taken in that Fall/Winter. A program with less than ★18 in a Fall/Winter session may be approved by the Department and the Faculty of Science. Students must contact the Department prior to September 1 to explore the possibility of a reduced course load. Most scholarships require a full course load of ★30 to be eligible for consideration. Graduation requires a minimum 2.3 GPA on the last ★60 credited to the degree, and a minimum 2.3 GPA on all CMPUT courses credited to the degree.

Specialization students must complete a minimum of ★24 in CMPUT courses at the 300- or 400-level offered at the University of Alberta.

Students can take a maximum of ★42 in 100-level courses.

Course selections in other departments and Faculties may be subject to enrolment management and GPA requirements.

Year 1

CMPUT (114 and 115) or (174 and 175)
MATH 114, 115
★6 junior English
★12 in options (see Notes 1, 2)

Year 2

★6 from CMPUT 201, 204, 229, 272, 291
MATH 120 or 125
★6 in Statistics (see Note 3)
★15 in options (see Notes 1, 2)

Year 3

★12 in CMPUT at the 300-level or 400- level (see Note 4)
★18 in options (see Notes 1,2)

Year 4

★12 in CMPUT at the 300-level or 400- level (see Note 4)
★18 in options (see Notes 1, 2)

Notes

(1) Options consist of Science options, Arts options, and other approved options. The options must satisfy at least ★21 from Science and at least ★12 from Arts; ★30 can be chosen from Science, Arts or another Faculty. At least ★9 in options must be at the 300-level or higher.

(2) Higher level CMPUT courses may require specific CMPUT, MATH or STAT courses as prerequisites. Therefore, prerequisites for higher level CMPUT courses must be considered when choosing options.

(3) Students must have ★6 in introductory statistics and probability. This can be satisfied by selecting (STAT 151 or 235) and STAT 252; or the more advanced sequences of (STAT 221 and 222); or (STAT 265 and 366);

(4) At least ★6 in CMPUT must be at the 400 level.

193.6.3 Specialization in Computing Science—Minor in Business

The minor in Business program is for students interested in a career that combines Computing Science and Business. Students in the program have access to a limited number of reserved places in Business courses. Business minor students should consider the Industrial Internship Program.

Continuation in the program requires the successful completion of at least ★18 in the previous Fall/Winter with a GPA of 2.3, and a GPA of at least 2.3 on all CMPUT and Business courses taken in that Fall/Winter. A program with less than ★18 in Fall/Winter Term may be approved by the Department and the Faculty of Science. Students must contact the Department prior to September 1 to explore the possibility of a reduced course load. Most scholarships require a full course load of ★30 to be eligible for consideration. Graduation requires a GPA of at least 2.3 on the last ★60 credited to the degree, and 2.3 on all CMPUT and Business courses credited to the degree. Note that ECON courses are not counted as Business courses.

Specialization with Business minor students must complete a minimum of ★24 in CMPUT courses at the 300- or 400-level offered at the University of Alberta.

Students can take a maximum of ★42 in 100-level courses.

Course selections in other departments and Faculties may be subject to enrolment management policies and GPA requirements.

Students who choose not to continue in the Specialization Computing Science program lose their status as "pursuing a Business Minor". Upon reapplication, students may be able to pursue the Business minor in the General Program if they meet the competitive admission GPA for this minor.

Year 1

CMPUT (114, 115) or (174, 175)
MATH 114, 115
ECON 101, 102
★6 junior English
★6 in options (See Note 1)

Year 2

CMPUT 201, 204, 229, 272, 291
MATH 120 or 125
★6 in Statistics (See Note 2)
★6 in options (See Note 1)

Year 3

CMPUT 300, 301, 379
★6 in CMPUT at the 300-level or higher (see Notes 3 and 4)
★15 in options (See Note 1)

Year 4

★9 in CMPUT at the 300-level or higher (see Notes 3 and 4)
★21 in options (See Note 1)

The required business component of the program consists of the following courses:

(1) ACCTG 311
(2) ECON 101, 102
(3) SMO 301
(4) Two of FIN 301, MARK 301, MGTSC 352, and SMO 321
(5) A minimum of ★6 in courses offered by the Faculty of Business and approved by the student's advisor

Notes

(1) Options consist of Science options, Arts options, Business options, and approved options from any Faculty. In addition to the specific requirements for the Business minor, the options must satisfy at least ★12 from Science and ★6 from Arts, and an additional ★12 that may be chosen from Science, Arts or another Faculty. At least ★9 in options must be at the 300-level or higher. Higher level CMPUT courses may require specific CMPUT, MATH or STAT courses as prerequisites. Therefore, prerequisites for higher level CMPUT courses must be considered when choosing options.

(2) Students must have ★6 in introductory statistics and probability. This can be satisfied by selecting (STAT 151 or 235) and STAT 252; or the more advanced sequences of (STAT 221 and 222); or (STAT 265 and 366);

(3) Students must take ★3 in Group A courses which include CMPUT 304, 325, 340 and 474. A complete list of Group A courses to be offered in a given year is available from the department.

(4) Students must take ★3 in Group B project courses which include CMPUT 400, 401, 410, 412, 414, 415, 422, and 466. The department may approve variations in the above requirement on application. CMPUT 400 satisfies the project requirement, but cannot be used as ★3 in CMPUT at the 300-level or higher or as a Science option.

193.6.4 Computing Science Specialization in Software Practice

The Software Practice program is for students interested in a career as a software professional. It gives students the ability to focus on topics in Computing Science that are most relevant to software professionals while pursuing relatively broad interests in Computing Science and in other disciplines. Students use the required Arts and approved options to build a foundation in disciplines related to, or influenced by, Computing Science. Course selections in other departments and Faculties may be subject to enrolment management policies and GPA requirements.

The Software Practice program includes the Industrial Internship Program component. Therefore, students are eligible to apply for ISP (Information Systems Professional) certification upon completing 24 months of work experience in the software industry and IIP experience counts towards this work experience. The ISP is a registered designation under the Professional and Occupational Associations Registration Act in Alberta. It was registered in February 1997, and is administered by the Registrar of CIPS Alberta.

Continuation in the program requires the successful completion of at least ★18 in the previous Fall/Winter with a GPA of 2.3, and a GPA of at least 2.3 on all CMPUT and Business courses taken in that Fall/Winter. A program with less than ★18 in a Fall/Winter session may be approved by the Department and the Faculty of Science. Students must contact the Department prior to September 1 to explore the possibility of a reduced course load. Most scholarships require a full course load of ★30 to be eligible for consideration. Graduation requires a GPA of at least 2.3 on the last ★60 credited to the degree, and 2.3 on all CMPUT and Business courses credited to the degree.

Specialization students in the Software Practice program must complete a minimum of ★24 in CMPUT courses at the 300- or 400-level offered at the University of Alberta.

Year 1

CMPUT (114, 115) or (174, 175); 272 (see Note 1)
MATH 114, 115
★6 junior English
★6 in Science options
★3 in an approved option

Year 2

CMPUT 201, 204, 229, 291
MATH 120 or 125
★6 in Statistics (See Note 3)
★6 in Arts options
★3 in an approved option

Year 3

CMPUT 300, 301, 379
★6 in CMPUT at the 300-level or higher (see Note 4)
★6 in Business options (see Note 2)
★3 in an Arts option
★6 in Science options

Year 4

IIP (WKEXP 921, 922) - 16 month Industrial Internship (Note: Students in the program who fail to obtain placement in the IIP must withdraw from the program, but may continue as Specialization or Honors students).

Year 5

CMPUT 325, 400, 401, 402
★3 in CMPUT at the 300-level or higher (see Note 4)
★6 in Business electives (see Note 2 below)
★3 in an approved option
★3 in a Science option
★3 in an Arts option

Note

(1) CMPUT 272 can be taken in second year. Please consult department for advice.

(2) Students must choose ★6 of their Business options from Management Information Systems (MIS) or Management Science (MGTSC), excluding MGTSC 312, as approved by the student's advisor.

(3) Students must have ★6 in introductory statistics and probability. This can be satisfied by selecting (STAT 151 or 235) and STAT 252; or the more advanced sequences of (STAT 221 and 222); or (STAT 265 and 366); Note that MGTSC 312 can be taken as an alternative to STAT 252, but is not counted as a Science option.

(4) Students must take ★3 in Group A courses which include CMPUT 304, 340 and 474. A complete list of Group A courses to be offered in a given year is available from the department.

193.6.5 Computing Science Honors Stream in Bioinformatics

The discipline of bioinformatics has developed out of the need for recording and analyzing very large sets from genome and DNA sequencing projects. The goal of the Bioinformatics program is to train students to understand, develop and use computational tools and large sets of sequence data to answer questions in biology and medicine.

The graduate will be able to understand problems embraced in bioinformatics and collaborate effectively with biologists in the construction and use of new bioinformatics tools. Interested students should select their first year science options according to the recommendations given below.

Continuation in the Honors program requires successful completion of at least ★24 in the previous Fall/Winter with a GPA of 3.0, and a GPA of 3.0 on all CMPUT courses taken in that Fall/Winter. Most scholarships require a full course load of ★30 to be eligible for consideration. Graduation requires a GPA of 3.0 on the last ★60 credited to the degree, and 3.0 on all CMPUT courses credited to the degree.

Students must complete a minimum of ★24 in CMPUT courses at the 300- or 400-level offered at the University of Alberta.

Each Fall and Winter term throughout their program, all Honors students must register in the Honors seminar CMPUT 495 (*0, 1hr/week). This seminar provides honors students with the opportunity to interact with faculty members and honors students from all years of the program to explore topics of interest.

Year 1

BIOL 107
CMPUT 174, 175 (Honors sections if offered), 272 (see Note 1)
MATH 114, 115 (see Note 2)
★3 in a BIOL or CHEM option
★3 in a Science option
★6 junior English

Year 2

BIOL 207
CMPUT 201, 204, 229, 291
GENET 270
MATH 125 and in one of MATH 225, 228, 229
★6 in Statistics (See Note 3)

Year 3

BIOIN 301
CMPUT 301, 325, 379, 391
★3 in CMPUT at the 300-level or higher
★3 in a BIOL option (see Note 4)
★3 in a GENET Option (see Note 4)
★3 in a Science option
★3 in an Arts option

Year 4

BIOIN 401
CMPUT 366
★9 in CMPUT at the 300-level or higher
★3 in a GENET Option (see Note 4)
★3 in a Science option
★9 in an Arts option

Notes

(1) Students are strongly encouraged to take CMPUT 272 in Year 1.

(2) Students are strongly encouraged to take the Honors version of the MATH courses, beginning in the first year.

(3) Students must have ★6 in introductory statistics and probability. This can be satisfied by selecting (STAT 151 or 235) and STAT 252; or the more advanced sequences of (STAT 221 and 222); or (STAT 265 and 366);

(4) The ★6 in GENET options must be chosen from GENET 275, 301, 302, 304 or 390. The ★3 in a BIOL option must be chosen from BIOL 321, 380 or BIOCH 200. Note: students interested in GENET 390 and BIOCH 200 are advised to take CHEM 101 and 261 in year 1.

193.6.6 Computing Science Specialization Stream in Bioinformatics

Continuation in the program requires the successful completion of at least ★18 in the previous Fall/Winter with a GPA of 2.3 and a GPA of 2.3 on all CMPUT courses taken in that Fall/Winter. A program with less than ★18 in a Fall/Winter session may be approved by the Department and the Faculty of Science. Students must contact the Department prior to September 1 to explore the possibility of a reduced course load. Most scholarships require a full course load of ★30 to be eligible for consideration. Graduation requires a GPA of 2.3 on the last ★60 credited to the degree, and 2.3 on all CMPUT courses credited to the degree.

Students must complete a minimum of ★24 in CMPUT courses at the 300- or 400-level offered at the University of Alberta.

Year 1 (Recommended Course Sequence)

BIOL 107
CMPUT (114 and 115) or (174 and 175); 272 (see Note 1)
MATH 114, 115
★3 in a BIOL or CHEM option
★3 in a Science option
★6 junior English

Year 2

BIOL 207
CMPUT 201, 204, 229, 291
GENET 270
MATH 120 or 125
★6 in Statistics (See Note 2)
★3 in an Arts option

Year 3

BIOIN 301
CMPUT 301, 325, 379
★3 in a BIOL option (see Note 3)
★6 in CMPUT at the 300-level or higher
★3 in a GENET Option (see Note 3)
★3 in Science options
★3 in an Arts option

Year 4

BIOIN 401
★3 in a GENET Option (see Note 3)
★9 in a CMPUT option at the 300-level or higher
★6 in Arts options
★9 in approved options

Notes

(1) Students are encouraged to take CMPUT 174 and 175. Students are strongly encouraged to take CMPUT 272 in Year 1.

(2) Students must have ★6 in introductory statistics and probability. This can be satisfied by selecting (STAT 151 or 235) and STAT 252; or the more advanced sequences of (STAT 221 and 222); or (STAT 265 and 366);

(3) The ★6 in GENET options must be chosen from GENET 275, 301, 302, 304 or 390. The ★3 in a BIOL option must be chosen from BIOL 321, 380 or BIOCH 200. Note: students interested in GENET 390 and BIOCH 200 are advised to take CHEM 101 and 261 in year 1.

193.6.7 Industrial Internship Program

Industrial Internship Program (IIP), similar to a co-op program, is offered to students in the Specialization or Honors programs in Computing Science (see §193.1.9 for program guidelines). The Industrial Internship designation will appear on the degree parchments of students who have participated in the program.

Students approved to enter this stream register for a continuous sequence of Science Work Experience courses (WKEXP 955, 956, 957, 958), starting in May, September or January. During the program, students are considered full-time students of the University. Work experience courses have no weight and are graded credit/no credit, and recorded on the student's transcript. The Industrial Internship Program Advisor maintains contact with the student and the person designated by the employer to be responsible for the student's progress. The student's progress is reviewed at approximately three-month intervals. If the review is unsatisfactory, the internship may be terminated and the student would then return to classes at the next available opportunity.

The graduation requirements for the Industrial Internship program designation include successful completion of at least WKEXP 955 and 956 plus CMPUT 400. CMPUT 400 must be taken in the first term immediately following completion of the WKEXP period. If required by the employer, the student's written report and oral presentation in CMPUT 400 may be classified confidential. The employer also assesses the student's performance during the work term. Based on the student's written report and oral presentation, and the report from the employer, students are awarded a grade in CMPUT 400.

Interested students should see the Industrial Internship Advisor in the Department of Computing Science for more information.

193.6.8 BSc General—Computing Science Minor

The Computing Science minor requires completion of a minimum ★24 to a maximum ★36 in CMPUT, with ★6 at the 300 level or higher. BIOIN 301 and 401 also can be used to complete this minor. Students will also need to complete prerequisite courses in MATH and STAT depending on the CMPUT courses chosen, and BIOL and GENET, if BIOIN courses are chosen.

There are many ways to design a Computing Science minor. Students should seek advice from a department advisor or visit our website at www.cs.ualberta.ca/courses.

193.6.9 BSc Program in Computer Engineering

A four-year program in Computer Engineering is offered jointly by the Faculty of Science and the Faculty of Engineering (see §82.5), and administered by the Department of Electrical and Computer Engineering. Students in the program will be registered in the Faculty of Engineering. Admission requirements are specified in §15.7. Promotion and Graduation regulations are found in §83.3.

193.6.10 BSc Specialization or Honors in Computing Science After an Undergraduate Degree (other than a BSc from the Faculty of Science at the University of Alberta)

In addition to the requirements set out in §193.1.8, a student pursuing this designation must also complete a minimum of ★24 in CMPUT courses at the 300- or 400-level offered at the University of Alberta as part of their ★60.

193.7 Earth and Atmospheric Sciences

Earth and Atmospheric Sciences encompass the study of the atmosphere, surface and interior of the earth. The Department administers nine academic programs: Honors and Specialization in Atmospheric Sciences, Honors and Specialization in Environmental Earth Science, Honors and Specialization in Geology, Honors and Specialization in Paleontology, and BA Major in Human Geography. **For details on major and minor in Human Geography, see Faculty of Arts listing.**

193.7.1 Honors in Atmospheric Sciences

Atmospheric science is the study of atmospheric composition, state and motion, from the small scale (e.g., the environment of a single leaf) through medium scales (e.g., a cumulus cloud) to the global scale (global pollution and warming). Most atmospheric scientists in Canada work for Environment Canada, providing weather forecasts or environmental information. Opportunities also arise with provincial governments and in the private sector.

Continuation in the Honors in Atmospheric Sciences program requires a GPA of at least 3.0 on at least ★24 in the previous Fall/Winter. Graduation requires a GPA of at least 3.0 on the last ★60 credited to the degree.

A student enrolling in the Honors program should consult the Atmospheric Sciences advisor before registration each year.

Year 1

CMPUT 101 or 114
EAS 100
★6 junior English
MATH 113 or 114, 115 and 120
PHYS 144 and 146
STAT 141 or 151

Year 2

EAS 212, 221, 270 and 294
MATH 214 and 215
PHYS 244 and 281
★3 Science option
★3 Arts option

Year 3

EAS 327, 370, 371, 372 and 373
PHYS 234
★6 in Arts options
★6 in Science options (see Note below)

Year 4

EAS 426
EAS 470, 471 and 475
★15 in Science options (see Note below)

Notes:

(1) Science options include but are not limited to CHEM 101, 102, 211, 213, 261, 263, 303; CMPUT 201, 204, 301, 304, 306, 340; EAS 105, 202, 208, 225, 250, 324, 325, 326, 352, 427, 451, 453, 454, 455, 457; ENCS 360; FOR 340, 372; GEOPH 210, 429; MATH 201, 334, 337, 372; PHYS 211, 261, 264, 364, 381, 481; SOILS 210, 440.

(2) For students in the Industrial Internship Program: EAS 401, WKEXP 955, 956.

(3) Recommended Arts options include any EAS X9X courses.

(4) Credit in Science 100 will be considered equivalent to CMPUT 101, EAS 100, MATH 113, 115, PHYS 144, 146, and ★9 Science options equivalent to CHEM 101, 102, and EAS 105, for students entering Atmospheric Science Honors.

193.7.2 Specialization in Atmospheric Sciences

Continuation in the Specialization in Atmospheric Sciences program requires a GPA of at least 2.3 on at least ★18 in the previous Fall/Winter. To graduate in four years, a student needs to complete ★30 per year. Students who extend their programs beyond five years must first obtain the written approval of the Faculty of Science and the Department of Earth and Atmospheric Sciences.

Graduation requires a GPA of at least 2.3 on the last ★60 credited to the degree.

A student enrolling in the Specialization program should confer with the Atmospheric Sciences program student advisor before registration each year.

Year 1

CMPUT 101 or 114
EAS 100
★6 junior ENGL
MATH 113 or 114, 115 and 120
PHYS 144 and 146
STAT 141 or 151

Year 2

EAS 212, 221, 270 and 294
MATH 214 and 215
PHYS 244 and 281
★3 in an Arts option
★3 in a Science option

Year 3

EAS 327, 370, 371, 372 and 373
PHYS 234
★6 in Arts options
★6 in Science options (see Note below)

Year 4

EAS 470, 471 and 475
★21 in Science options

Notes:

(1) Science options include but are not limited to CHEM 101, 102, 211, 213, 261, 263, 303; CMPUT 201, 204, 301, 304, 306, 340; EAS 105, 202, 208, 225, 250, 324, 325, 326, 352, 427, 451, 453, 454, 455, 457; ENCS 360; FOR 340, 372; GEOPH 210, 429; MATH 201, 334, 337, 372; PHYS 211, 261, 264, 364, 381, 481; SOILS 210, 440.

(2) For students in the Industrial Internship Program: EAS 401, WKEXP 955, 956.

(3) Recommended Arts options include any EAS X9X courses.

(4) Credit in Science 100 will be considered equivalent to CMPUT 101, EAS 100, MATH 113, 115, PHYS 144, 146, and ★9 Science options equivalent to CHEM 101, 102, and EAS 105, for students entering Atmospheric Science Specialization.

193.7.3 Honors in Environmental Earth Sciences

Environmental Earth Science is the study of interactions between humans and Earth's natural environment. It encompasses the influence of human activities on the local and global environment, as well as how our actions are shaped and controlled by the geologic and geomorphic processes occurring around us. Environmental Earth Scientists are typically employed by consulting companies, large resource and industrial firms, and government organizations.

Continuation in the Honors in Environmental Earth Sciences program requires a GPA of at least 3.0 on at least ★24 in the previous Fall/Winter.

Graduation requires a GPA of at least 3.0 on the last ★60 credited to the degree.

A student enrolling in the Honors program should confer with the Environmental Earth Sciences Program student advisor before registration each year.

Year 1

CHEM 101 and 102
EAS 100 and 105
★6 junior English
MATH 113 or 114 and 115
PHYS 124 and 126 or PHYS 144 and 146

Year 2

BIOL 108
EAS 221, 222, 224, 225, 233, 234, and 294, and either 212 or 270
STAT 141 or 151

Year 3

BIOL 208
EAS 250, 320, 323, 324 and 354
★6 of EAS 327 or 351 or 451
GEOPH 223
★3 Arts option

Year 4

EAS 425 or 468
EAS 426
★6 of EAS 457 or 458
★6 Arts options
★9 Science and related options

Notes:

(1) EAS 458 may be taken more than once for credit. Science and related options require the approval of the Environmental Earth Sciences advisor.
(2) For students in the Industrial Internship Program: EAS 401, WKEXP 955, 956.
(3) Credit in Science 100 will be considered equivalent to BIOL 108, CHEM 101, 102, EAS 100, 105, MATH 113, 115, and PHYS 144, 146 for students entering Environmental Earth Science Honors.

193.7.4 Specialization in Environmental Earth Sciences

Continuation in the Specialization in Environmental Earth Sciences program requires a GPA of at least 2.3 on at least ★18 in the previous Fall/Winter. To graduate in four years, a student needs ★30 per year. Students who extend their programs beyond five years must first obtain the written approval of the Faculty of Science and the Department of Earth and Atmospheric Sciences.

Graduation requires a GPA of at least 2.3 on the last ★60 credited to the degree.

A student enrolling in the Specialization program should confer with the Environmental Earth Sciences Program student advisor before registration.

Year 1

CHEM 101 and 102
EAS 100 and 105
★6 junior ENGL
MATH 113 or 114 and 115
PHYS 124 and 126 or PHYS 144 and 146

Year 2

BIOL 108
EAS 221, 222, 224, 225, 233, 234, and 294, and either 212 or 270
STAT 141 or 151

Year 3

BIOL 208
EAS 250, 320, 323, 324 and 354
★6 of EAS 327 or 351 or 451
GEOPH 223
★3 in an Arts option

Year 4

EAS 425 or 468
★6 of EAS 457 or 458
★6 in Arts options
★15 Science and related options

Notes:

(1) EAS 458 may be taken more than once for credit. Science and related options require the approval of the Environmental Earth Sciences advisor.
(2) For students in the Industrial Internship Program: EAS 401, WKEXP 955, 956.
(3) Credit in Science 100 will be considered equivalent to BIOL 108, CHEM 101, 102, EAS 100, 105, MATH 113, 115, PHYS 144 and 146, for students entering Environmental Earth Science Specialization.

193.7.5 Honors in Geology

Geology is the study of the planet Earth—the materials it is made of, the processes which affect these materials, and the origin and evolution of life. Geologists are employed by companies engaged in exploration for and production of minerals and fuels, by government agencies, by companies engaged in engineering and environmental projects, and by universities.

Continuation in the Honors in Geology program requires a GPA of 3.0 on at least ★24 in the previous Fall/Winter.

Graduation requires a minimum GPA of 3.0 on the last ★60 credited to the degree.

A student enrolling in the Honors program should consult the Geology program student advisor before registration each year.

Year 1

CHEM 101 and 102
EAS 100 and 105
★6 junior English
MATH 113 or 114 and 115
PHYS 124 and 126 or PHYS 144 and 146

Year 2

EAS 221, 222, 224, 225, 230, 232, 233, and 234
★3 Arts option
★3 Option

Year 3

EAS 320, 323, 331, 332, 333 and 336
EAS 364 or 368
GEOPH 210 or 223 or 224
★3 Arts option
★3 Science option

Year 4

EAS 426
GEOPH 210 or 223 or 224
★6 Arts option
★12 EAS Science courses numbered 300 or higher
★3 Science option

Notes:

(1) Recommended Arts options include any EAS X9X courses.
(2) For students in the Industrial Internship Program: EAS 401, WKEXP 955, 956.
(3) Credit in Science 100 will be considered equivalent to BIOL 108, CHEM 101, 102, EAS 100, 105, MATH 113, 115, PHYS 144 and 146, for students entering Geology Honors.

193.7.6 Specialization in Geology

Continuation in the Specialization in Geology program requires a GPA of at least 2.3 on at least ★18 in the previous Fall/Winter. To graduate in four years, a student needs to complete ★30 per year. Students who extend their programs beyond five years must first obtain the written approval of the Faculty of Science and the Department of Earth and Atmospheric Sciences.

Graduation requires a GPA of at least 2.3 on the last ★60 credited to the degree.

A student enrolling in the Specialization program should consult the Geology program student advisor before registration each year.

Year 1

CHEM 101 and 102
EAS 100 and 105
★6 junior ENGL
MATH 113 or 114 and 115
PHYS 124 and 126 or PHYS 144 and 146

Year 2

EAS 221, 222, 224, 225, 230, 232, 233 and 234
★3 Arts option
★3 Option

Year 3

EAS 320, 323, 331, 332, 333 and 336
EAS 364 or 368
GEOPH 210 or 223 or 224
★3 Arts option
★3 Science option

Year 4

GEOPH 210 or 223 or 224
★15 EAS Science courses numbered 300 or higher
★6 Arts options
★3 Science option
★3 Option

Notes:

(1) Recommended Arts options include any EAS X9X courses.
(2) For students in the Industrial Internship Program: EAS 401, WKEXP 955, 956.
(3) Credit in Science 100 will be considered equivalent to BIOL 108, CHEM 101, 102, EAS 100, 105, MATH 113, 115, PHYS 144 and 146, for students entering Geology Specialization.

193.7.7 Honors and Specialization in Paleontology

See §193.14, Paleontology, for details on the Honors and Specialization Paleontology programs.

193.7.8 Industrial Internship Program

An Industrial Internship Program, similar to a co-op program, is offered to students in the Specialization or Honors programs in Earth and Atmospheric Sciences (see §193.1.9 for guidelines to the program). The Industrial Internship designation will appear on the degree parchments of students who have participated in the program.

Students approved to enter this stream register for a continuous sequence of Science Work Experience courses (WKEXP 955, 956, 957, 958), starting in May, September or January. During the program, students are considered full-time students of the University. Work experience courses have no weight and are graded credit/no credit, and recorded on the student's transcript. The Industrial

Internship Program Advisor maintains contact at approximately three-month intervals with the student and the person designated by the employer to be responsible for the student's progress. This arrangement ensures satisfaction on all sides. If the review shows the situation is not satisfactory, the internship may be terminated and the student would then return to classes at the next available opportunity. The graduation requirements for the Industrial Internship program designation include successful completion of at least WKEXP 955 and 956 plus EAS 401. EAS 401 must be taken in the first term immediately following completion of the WKEXP period. If required by the employer, the student's written report and oral presentation in EAS 401 may be classified confidential. The employer also assesses the student's performance during the work term. Based on the student's written report and oral presentation, and the report from the employer, students are awarded a grade in EAS 401.

Interested students should see the Industrial Internship Advisor in the Department of Earth and Atmospheric Sciences for more information.

193.7.9 Professional Registration

Graduates of EAS programs may qualify for registration as professional geologists (P. Geol.). The practice of geology in Alberta is governed by provincial law in the interest of public protection against unskilled practice. The right to practice independently (meaning that you are legally able to accept responsibility for your work and sign for it), and the right to use the title of professional geologist (P. Geol.), are restricted to individuals registered by the Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA). Members of the PS Warren student society are automatically student members of APEGGA and as such are introduced to the professional association.

Individuals who are planning to meet the knowledge requirements for P. Geol. while also completing their degree at the University of Alberta should plan their program course selection carefully. Attention is drawn in particular to the science subject requirements, additional to calculus, physics and chemistry. APEGGA verifies that specific knowledge requirements are met, by reviewing academic credentials course-by-course. Holders of degrees that do not cover the APEGGA syllabus may be assessed examinations in missing subjects by the APEGGA Board of Examiners before being accepted for registration. Current syllabus and registration information is available at the Departmental Office or from APEGGA. Full information is available at http://www.apegga.com/

Specific questions about programs of study or individual courses applicable to professional registration can also be directed to the Departmental APEGGA Liaison.

193.8 Geophysics

The Department of Physics offers two programs dealing with solid earth physics. The Honors in Geophysics program (see §193.16.3) prepares students for graduate work in geophysics. The Specialization in Geophysics program prepares students with the conceptual and laboratory background required for employment at the BSc level in industry, government and technical schools. Also see §193.16 (Physics).

193.8.1 Professional Association

The practice of geophysics in Alberta is regulated by the Association of Professional Engineers, Geologists and Geophysicists of Alberta (APEGGA).

The right to practise geophysics in Alberta and accept professional responsibility for such work as well as the right to use the geophysicist title is limited to those registered with APEGGA.

Members of the Geophysics Student Society are automatically student members of APEGGA. Graduates are encouraged to join APEGGA as Geophysicists-in-training. Acceptable experience following graduation is necessary for registration as a Professional Geophysicist, the APEGGA membership category which confers the right to accept responsibility for geophysical work. Contact the APEGGA office for more information.

193.9 Immunology and Infection

193.9.1 Honors in Immunology and Infection

Continuation in the Honors in Immunology and Infection requires a minimum GPA of 3.0 in each preceding Fall/Winter. Graduation requires a minimum GPA of 3.0 on the last ★60 credited to the degree. Students in the Honors program must take at least ★24 in the Fall/Winter of each year. Exceptions to this requirement must be approved by the Department of Biological Sciences and the Faculty of Science office.

193.9.2 Specialization in Immunology and Infection

Continuation in the Specialization in Immunology and Infection requires a minimum GPA of 2.3 in each preceding Fall/Winter. Graduation requires a GPA of 2.3 in all courses credited to the degree. Students in Specialization programs must take at least ★24 during the Fall/Winter of each year of the program. Exceptions to this requirement must be approved by the Department and the Faculty Office.

Year 1

BIOL 107, 108
CHEM 101, 102
CHEM 164 or 261
MATH 113 or 114 or 120
STAT 141 or 151
★3 Approved Option
★6 Arts options (English recommended)

Year 2

BIOCH 200
BIOL 201
BIOL 207, 208
CHEM 263
IMIN 200
MICRB 265
3 Approved Option (GENET 270 highly recommended)[1]
★6 Arts options

Years 3 and 4

ZOOL 241 and 242 or PHYSL 210 or 211
One of: BIOCH 430; GENET 304; MICRB 316
IMIN 324, 371, 452
MMI 351
ZOOL 352
★6 Arts options
★9 from the List below[2]
★21 Approved Options from the List below or options approved by an advisor[3]

[1] GENET 270 is the prerequisite for: GENET 304, MICRB 316

[2]At least ★3 must be in a course with a laboratory component.

[3]Honors students must take BIOL 499 or MMI 499 and reduce Approved Options to ★15.

List

BIOCH 320, 330, 430, 450
CELL 300
ENT 378
GENET 270, 304
IMIN 372, 401
MICRB 316
MMI 352, 405, 415, 426
ZOOL 354, 452

Note: Normally only ★12 are allowed outside the Faculties of Science and Arts in the entire program. See §194 for courses outside the Faculty of Science that will be considered as Science options.

193.10 Marine Science

Excellent opportunities for the study of marine biology and related subjects exist at Bamfield Marine Sciences Centre (BMSC) on Vancouver Island, BC. An academic program operates at the station, in which summer study will provide credit toward degrees in Science.

Prerequisite for all the MA SC courses is consent of the Department of Biological Sciences.

Students are expected to take a full course load of ★15 during the fall term. Courses run Monday to Saturday.

A refundable deposit of $100 is payable at the time of application.

An extension fee of $1,000 must be paid on arrival at BMSC to cover the cost of field trips, lab supplies and course materials.

There is a mandatory room and board charge of $1,840 for the 13 weeks.

Information concerning course prerequisites and application procedures for Marine Science may be obtained from the Department of Biological Sciences or the Office of the Dean of Science. Permission to register in these courses is available from the Director of the Bamfield Marine Sciences Centre, to whom application should be made.

See §231 Course Listings for descriptions of available Marine Science courses.

193.11 Mathematics

193.11.1 Honors in Mathematics

Continuation in the Honors in Mathematics program requires a minimum GPA of 3.0 in the preceding Fall/Winter. Graduation requires a minimum GPA of 3.0 on ★24 in each Fall/Winter.

Year 1

MATH 117, 118, 127, 228
★6 in an approved Science option
★6 in approved Arts options
★6 in approved options

Year 2

MATH 217, 227, 317, either 328 or 334
★6 in approved Science options
★6 in approved Arts options
★6 in approved options

Years 3 and 4

★30 in MATH courses
★6 in approved Science options
★6 in approved Arts options
★18 in approved options

The program must include MATH 325, 328 or 424, 334, 411, 417, 418, 446 or 448, 447, 496 and ★3 in a Computing Science or Statistics option.

The Honors Seminar, MATH 496, should normally be taken in the fourth year. Note that several of the required courses, including MATH 496, are only given in alternate years.

Honors in Applied Mathematics

Continuation in the Honors in Applied Mathematics program requires a minimum GPA of 3.0 in the preceding Fall/Winter. Graduation requires a minimum GPA of 3.0 on ★24 in each Fall/Winter.

Year 1

MATH 117, 118, 127, 228
★6 in approved Science options
★6 in approved Arts options
★6 in approved options

Year 2

MATH 217, 227, 317, 334
★6 in approved Science options
★6 in approved Arts options
★6 in approved options

Years 3 and 4

★21 in Mathematics courses
★6 in approved options at the 300-level in the field of application
★3 in an approved 300- or 400-level Mathematics and/or Mathematical Physics option
★12 in approved Science options
★6 in approved Arts options
★12 in approved options

The program must include in the third and fourth years: MATH 337, 381, 411, 417, 436, 496; one of MATH 373 or 421 and ★3 in a Computing Science or Statistics option. The Honors Seminar, MATH 496, should normally be taken in the fourth year. Note that several of the required courses, including MATH 496, are only given in alternate years.

Minor in Statistics

The degrees Honors in Mathematics and Honors in Applied Mathematics can each be obtained with a minor in Statistics if the student's program includes STAT 265, 366, 378, 471, and two of STAT 368, 441, 472, 479.

Minor in Computing Science

The degrees Honors in Mathematics and Honors in Applied Mathematics can each be obtained with a minor in Computing Science. The student's program must include CMPUT 114 and 115 or 174 and 175, 201, 204, 272, 291, 304, 328 and at least an additional ★3 in Computing Science at the 300- or 400-level.

The Department also offers a BA Honors in Mathematics (see §44.17.1).

Honors in Mathematical Physics

See §193.16.4 for details.

Honors in Statistics

See §193.19.1 for details.

193.11.2 Specialization in Actuarial Science—Business Minor

Continuation in the program normally requires successful completion of at least ★24 in the previous Fall/Winter with a GPA of at least 2.9, and a GPA of at least 2.9 on all ECON, FIN, MATH and STAT courses taken in that Fall/Winter.

Before the beginning of the last Fall/Winter term of the program, passing the first two SOA actuarial exams, P and FM, is required. If a student fails to meet this requirement, a second chance to pass the failed exams is given in the last Fall/Winter term of the program.

In the last Fall/Winter of the program, a GPA of at least 2.7 and a GPA of at least 2.7 on all ECON, FIN, MATH and STAT courses taken in that Fall/Winter is required.

Graduation requires a GPA of at least 2.7 on all courses credited toward the degree and a GPA of at least 2.7 on all ECON, FIN, MATH and STAT courses credited towards the degree.

The program must contain the following courses. It is recommended that these courses be taken in the years indicated.

Year 1

CMPUT 101, 114
ECON 101, 102
MATH 114, 115
MATH 125
STAT 151
★6 in junior English

Year 2

MATH 214, 215
MATH 225
MATH 253
STAT 265
STAT 353
★6 Arts options
★6 options

Year 3

ACCTG 311
FIN 301
MGTSC 352
STAT 366, 378, 432
STAT 354 or 355
STAT 453
★6 in options

Year 4

MATH 356, 357
STAT 454 or 455
STAT 471
STAT 479
★9 in FIN options
★6 in options

Notes

(1) Each student's program must have the approval of the Department of Mathematical and Statistical Sciences and must include
   a. At least ★18 in Arts
   b. At least ★18 and not more than ★24 in Business
(2) Students are encouraged to study ethics and economics and to choose their Arts options from PHIL 250 and ECON 281, 282, 341.
(3) Students are encouraged to choose their Business options from the following courses: FIN 412, 413, 416, 418, 422, 434; MGTSC 405, 422. In particular, FIN 434 is one of the approved courses for Validation by Educational Experience (VEE). (See the Society of Actuaries website www.soa.org/ccm/content and follow the links Education and Jobs, Candidate and Exam Information.)
(4) A corresponding Honors MATH course can be substituted for any MATH course listed. For example, MATH 117 can be substituted for MATH 114.

193.11.3 Specialization in Mathematics

Continuation in the program normally requires successful completion of at least ★24 in the previous Fall/Winter with a GPA of at least 2.3, and a GPA of at least 2.3 on all MATH courses taken in that Fall/Winter.

In the last Fall/Winter of the program, a GPA of at least 2.3 and a GPA of at least 2.3 on all MATH courses taken in that Fall/Winter is required.

Graduation requires a GPA of at least 2.3 on all courses credited toward the degree and a GPA of at least 2.3 on all MATH courses credited toward the degree.

The program must contain the following courses. It is recommended that these courses be taken in the years indicated.

Year 1

MATH 114, 115
MATH 125
CMPUT 101 and 114, or 114 and 115, or 174 and 175
★6 in junior English
★3 in a Science option
★6 in options

Year 2

MATH 214, 215
MATH 225
MATH 228
★3 in a MATH option
★3 in a Science option
★6 in Arts options
★6 in options

Year 3

MATH 314, 414
★6 in MATH options
★6 in Science options
★6 in Arts options
★6 in options

Year 4

★12 in MATH at the 300- or 400-level
★6 in Science options
★12 in options

Notes

(1) Each student's program must have the approval of the Department of Mathematical and Statistical Sciences.
(2) A student must take at least ★6 in MATH in each Fall/Winter of the program.
(3) A corresponding Honors MATH course can be substituted for any MATH course listed. For example, MATH 117 can be substituted for MATH 114.
(4) Students interested in taking non-junior CMPUT courses as options in subsequent years should note that CMPUT 115 or 175 is a prerequisite for most non-junior CMPUT courses.

193.11.4 Specialization in Computational Science (Mathematics)

Continuation in the program normally requires successful completion of at least ★24 in the previous Fall/Winter with a GPA of at least 2.3, and a GPA of at least 2.3 on the aggregate of all CMPUT, MATH and STAT courses taken in that Fall/Winter.

In the last Fall/Winter of the program, a GPA of at least 2.3 and a GPA of at least 2.3 on the aggregate of all CMPUT, MATH and STAT courses taken in that Fall/Winter is required.

Graduation requires a GPA of at least 2.3 on all courses credited toward the degree and a GPA of at least 2.3 on the aggregate of all CMPUT, MATH and STAT courses credited toward the degree.

The program must contain the following courses. It is recommended that these courses be taken in the years indicated.

Year 1

CMPUT 114, 115, or 174 and 175
MATH 114 and 115, or 117 and 118
MATH 125
★6 in a junior English
★9 in options

Year 2

CMPUT 201, 204, 272
MATH 214 and 215, or 217 and 317
MATH 222, 225
STAT 221
★6 in Arts

Year 3

CMPUT 229, 291
MATH 228, 381
STAT 222
★3 in MATH or STAT
★3 in Arts
★9 in options

Year 4

★6 in CMPUT at 300-level or higher
★6 in MATH or STAT at 300-level or higher
★3 in an option at 300-level or higher
★3 in Arts
★12 in options

Notes

(1) The program must contain at least ★72 in Science and ★18 in Arts.
(2) Recommended MATH options include MATH 314, 322, 324, 325, 334, 337, 373, 414, 421, 422, 481.
(3) Recommended CMPUT options include CMPUT 301, 304, 313, 325, 379, 391, 401, 411.
(4) Recommended STAT options include STAT 368, 378, 466, 471, 479.
(5) STAT 265/366 can be substituted for STAT 221, 222.
(6) Each student's program must have the approval of the Department of Mathematical and Statistical Sciences.

193.11.5 Mathematics and Economics

The Faculty of Science offers an Honors degree and a Specialization degree in Mathematics and Economics.

Honors in Mathematics and Economics

Continuation in the Honors in Mathematics and Economics program requires a minimum GPA of 3.0 in the previous Fall/Winter. Graduation requires a minimum GPA of 3.0 on ★24 in each Fall/Winter.

Year 1

ECON 101, 102
MATH 117, 118, 127, 228
★6 in a junior English
★6 in approved Science options

Year 2

ECON 281, 282
MATH 217, 317
STAT 265, 366
★6 in approved Science options
★6 in approved options

Years 3 and 4

★24 in Economics
★24 in MATH or STAT courses
★6 in approved Science options
★6 in approved options

The program must contain MATH 227; ECON 384, 385, 481, 482, 407, 408; STAT 366; and four of MATH 334, 373, 381, 411, 417, 421, 422, 481. Credit is not given for ECON 386, 387, or 399.

Specialization in Mathematics and Economics

Continuation in the program normally requires successful completion of at least ★24 in the previous Fall/Winter with a GPA of at least 2.3, and a GPA of at least 2.3 on the aggregate of all ECON, MATH, and STAT courses taken in that Fall/Winter.

In the last Fall/Winter of the program a GPA of at least 2.3 and a GPA of at least 2.3 on the aggregate of all ECON, MATH, and STAT courses taken in that Fall/Winter is required.

Graduation requires a GPA of at least 2.3 on all courses credited toward the degree and a GPA of at least 2.3 on the aggregate of all ECON, MATH, and STAT courses credited toward the degree.

The program must contain the following courses. It is recommended that these courses be taken in the years indicated.

Year 1

ECON 101, 102
MATH 114, 115, 125
STAT 151
★6 in junior English
★3 in a Science option
★3 in an option

Year 2

ECON 281, 282
MATH 214, 215, 225
STAT 265
★9 in Science options
★3 in an option

Years 3 and 4

STAT 366
★24 in ECON including either ECON 399 or both ECON 407 and 408
★18 in MATH or STAT options
★15 in options

Notes

(1) Each student's program must have the approval of the Department of Mathematical and Statistical Sciences and must include
  a. at least ★63 in Science
  b. at least ★45 in MATH and STAT with at least ★12 of these at the 300-level or higher

c. CMPUT 101 and 114, or 114 and 115, or 174 and 175
d. at least ★36 in ECON, including ★12 chosen from ECON 384, 385, 399, or courses at the 400-level or higher.

(2) Credit will not normally be given for ECON 299, 386, or 387.
(3) Students who are considering graduate work in Economics should take ECON 407 and 408.
(4) A Student must take at least ★6 in ECON, MATH, or STAT in each Fall/Winter of the program.
(5) A corresponding Honors MATH course can be substituted for any MATH course listed. For example, MATH 117 can be substituted for MATH 114.
(6) Students interested in taking non-junior CMPUT courses as options in subsequent years should note that CMPUT 115 or 175 is a prerequisite for most non-junior CMPUT courses.

193.11.6 Specialization in Mathematics and Finance

Continuation in the program normally requires successful completion of at least ★24 in the previous Fall/Winter with a GPA of at least 2.3, and a GPA of at least 2.3 on the aggregate of all ACCTG, ECON, FIN, MATH, MGTSC, and STAT courses taken in that Fall/Winter.

In the last Fall/Winter of the program a GPA of at least 2.3 and a GPA of at least 2.3 on the aggregate of all ACCTG, ECON, FIN, MATH, MGTSC and STAT courses taken in that Fall/Winter is required.

Graduation requires a GPA of at least 2.3 on all courses credited toward the degree and a GPA of at least 2.3 on the aggregate of all ACCTG, ECON, FIN, MATH, MGTSC, and STAT courses credited toward the degree.

The program must contain the following courses. It is recommended that these courses be taken in the years indicated.

Year 1

CMPUT 101 and 114, or 114 and 115, or 174 and 175
ECON 101, 102
MATH 114, 115, 125
STAT 151
★6 in junior English

Year 2

ACCTG 311
ECON 281
MATH 214, 215
MATH 225, 253
MGTSC 352
STAT 265
★6 in options

Year 3

FIN 301
STAT 353
MATH 356, 357
STAT 366
★3 in a FIN option
★12 in options

Year 4

MATH 314, 414
MATH 373
ECON 399 or STAT 378
★6 in FIN options
★12 in options

Notes

(1) Each student's program must have the approval of the Department of Mathematical and Statistical Sciences and must include
a. ★18 in Arts courses
b. ★63 in Science courses
c. ★33 in ACCTG, ECON, FIN, or MGTSC, including ★9 in 400-level FIN
(2) Approved ACCTG, ECON, FIN and MGTSC options include ACCTG 322, 412, 432, 443, ECON 282, 384, 385, 407, 408, 481, 482; FIN 412, 413, 414, 416, 422, 434, 442; MGTSC 404, 405.
(3) Recommended Science options include: MATH 334, 337, 354, 381, 432, 481; STAT 466, 471, 472, 479.
(4) A corresponding Honors MATH course can be substituted for any MATH course listed. For example, MATH 117 can be substituted for MATH 114.
(5) Students interested in taking non-junior CMPUT courses as options in subsequent years should note that CMPUT 115 or 175 is a prerequisite for most non-junior CMPUT courses.

193.11.7 Industrial Internship Program

An Industrial Internship Program, similar to a co-op program, is offered to students in the Specialization or Honors programs in Mathematical and Statistical Sciences (see §193.1.9 for guidelines to the program). The Industrial Internship designation will appear on the degree parchments of students who have participated in the program.

Students approved to enter this stream register for a continuous sequence of Science Work Experience courses (WKEXP 955, 956, 957, 958), starting in May, September or January. During the program, students are considered full-time students of the University. Work experience courses have no weight and are graded credit/no credit, and recorded on the student's transcript. The Industrial Internship Program Advisor maintains contact at approximately three-month intervals with the student and the person designated by the employer to be responsible for the student's progress. This arrangement ensures satisfaction on all sides. If the review shows the situation is not satisfactory, the internship may be terminated and the student would then return to classes at the next available opportunity. The graduation requirements for the Industrial Internship program designation include successful completion of at least WKEXP 955 and 956 plus MATH or STAT 400. MATH or STAT 400 must be taken in the first term immediately following completion of the WKEXP period. If required by the employer, the student's written report and oral presentation in MATH or STAT 400 may be classified confidential. The employer also assesses the student's performance during the work term. Based on the student's written report and oral presentation, and the report from the employer, students are awarded a grade in MATH or STAT 400.

Interested students should see the Industrial Internship Advisor in the Department of Mathematical and Statistical Sciences for more information.

193.12 Neuroscience

193.12.1 Honors in Neuroscience

The Honors program in Neuroscience is an interdisciplinary program coordinated by the Centre for Neuroscience and administered by the Faculty of Science. This program is for students planning a career in Neuroscience.

Entry into the Honors Program from high school requires a minimum matriculation average of 80% with completed credits in Biology 30, Chemistry 30 and Physics 30 as prerequisites for admission.

Neuroscience is a broadly based discipline covering all aspects of brain function. Some major areas are brain development, nerve cells and synapses, sensation and perception, learning and memory, control of movement, animal behavior, cognitive psychology, and disorders of the nervous system.

The honors program introduces the major areas of Neuroscience and allows students to explore topics of interest in their final year.

Continuation in the Honors program requires a minimum GPA of 3.3 in each preceding Fall/Winter. Graduation requires a minimum GPA of 3.3 on ★60 in Years 3 and 4 of the program. Each program of study must be approved by the program coordinator in the Centre for Neuroscience.

A full course load of ★30 per academic year must be maintained throughout each year of the Honors program. Courses cannot be deferred to the Spring/Summer Terms without prior permission of the program coordinator.

Year 1

BIOL 107, 108
CHEM 101, 261
★6 of ENGL 100-series
MATH 113 or 114
MATH 115 or STAT 141 or 151
PHYS 124, 126

Year 2

BIOCH 200
BIOL 207
CHEM 263
PHYSL 212, 214
PSYCO 104 and 275
★6 in Science options
★3 in Arts options

Year 3

NEURO 375
PMCOL 371
PHYSL 372
One of PSYCO 377, 371; GENET 270, 390; ZOOL 342, 344
★12 in approved Science options
★6 in Arts options

Year 4

NEURO 450
NEURO 451 and/or 452
★6 chosen from the following courses covering topics in Cellular and Molecular Neuroscience: NEURO 410; PHYSL 444; PMCOL 412
★6 chosen from the following courses covering topics in Systems and Cognitive Neuroscience: NEURO 443, 472, 496; PSYCI 511; PSYCO 478.

★6 (if NEURO 451 and 452 are both taken) or ★9 (if one of NEURO 451 or 452 is taken) of science options chosen from the following: PMCOL 512; PHYSL 401, 403, 405, 527; ZOOL 442. Other choices require approval of the Centre for Neuroscience.
★3 in Arts options

Notes

(1) Each student's program must include:
   a. a minimum of ★18 in Arts courses;
   b. a minimum of ★90 in Science courses;
   c. no more than ★12 in non-Science, non-Arts courses
   d. no more than ★42 at the junior level
(2) Courses in Faculties outside of the Faculties of Arts and Science require prior approval by the Centre for Neuroscience and these courses cannot be credited as Arts or Science options.
(3) Each student's program must have the approval of the Centre for Neuroscience.
(4) Approved science options in years 1-3 may be chosen from the following: BIOCH 410, 430; BIOL 201, 315, 380; CELL 300, 301, 402, 415, 445; CHEM 211, 213, 313; CMPUT 114, 115, 174, 175, 201, 204, 299, 329, 366; EAS 100, 105, 201, 207, 230; ENT 220, 321; GENET 270, 275, 301, 302, 304, 390; IMIN 200, 371, 452; MATH 214; MICRB 265, 311; PMCOL 201, 305, 343, 344, 415; PHYS 208, 211, 234, 281; PHYSL 401, 402, 403, 404; PSYCO 267, 281, 354, 365, 371, 372, 377, 381, 385, 458, 485; STAT 221, 222, 252, 337; ZOOL 342, 343, 344, 370.
(5) Suggested Arts options include the following: ANTHR 230, 332; CLASS 110, 254, 255; C LIT 342; HIST 391, 396, 397, 398, 399; PHIL 205, 217, 265, 317, 366, 375, 386; PSYCO 105, 212, 233, 258, 339, 350, 357; WRITE 298. Any course from ENGL, FREN, GERM, ITAL, JAPAN, SPAN, RUSS.
(6) Approved non-Science/non-Arts options may be chosen from the following: ANAT 200, 401; REHAB 454.
(7) In the fourth year, all students must successfully complete an individual study program with members of the Centre for Neuroscience. This program consists of a reading course, NEURO 450, and a laboratory course, NEURO 451/452. Students must consult the Centre for Neuroscience before the beginning of their fourth year to arrange an individual study program.

193.13 Northern Studies

Students interested in Canada's North and especially those planning a career in northern Canada should include within their curriculum some of the following: ANTHR 246, 340, 355, 445, and 446; BIOL 366; CANST 302 and 408; EAS 453 and 455; ENCS 201; INT D 443; POL S 432. These courses may be taken within the framework of existing General, Specialization, or Honors programs in the Faculty of Science. Students interested in Northern Studies should mention this to their faculty advisor.

193.14 Paleontology

Paleontology is a basic science concerned with the evolutionary history of life. Students are required to have a broad knowledge base of biological and geological knowledge. Areas of detailed knowledge will include vertebrate and invertebrate paleobiology, paleobotany, evolutionary biology, systematics, functional morphology, sedimentology, stratigraphy, and plate tectonics. Paleontologists usually hold advanced research degrees and work as research scientists and teachers in universities, museums, and industrial laboratories.

193.14.1 Honors in Paleontology

The Honors program is administered by the Departments of Earth and Atmospheric Sciences and Biological Sciences. The curriculum is drawn from both departments enabling students to develop a broad knowledge base that will prepare them for later entry into more specialized postgraduate studies in their selected paleontological discipline. Interested students should consult with an Honors program advisor to prepare their programs.

The Honors Paleontology program follows the Faculty of Science rules and regulations governing standards of admission, continuation and graduation (see §193.1.1).

Year 1

BIOL 107 and 108
CHEM 101 or 164
EAS 100, 105 and 110
★6 junior English
MATH 113 or 114 or 120
STAT 151

Year 2

ANTHR 209
BIOL 207 and 208
BOT 210
EAS 222, 230, 233 and 234
★3 approved Arts option
★3 approved Science option

Year 3

BIOL 321 and 335
EAS 336
PALEO 414 or BOT 411
ZOOL 224, 250 and 325
★6 approved Arts options
★3 approved Science option

Year 4

ANTHR 390 and 391
BIOL 499 or EAS 426
PALEO 400, 418 and 419
PALEO 414 or BOT 411
★6 approved Science options

Notes:

(1) PALEO 414 is offered in alternate years but must be taken in Year 3 or 4. Approved Science options: BIOL 315, 361, 364; EAS 207, 224, 250, 460, 462, 465; ENT 220; ZOOL 405, 407, 408, 427. Arts options: ANTHR 391; CHRTC 350, 451; PHIL 265, 317. For information regarding additional approved options, please consult your Department advisor.
(2) Credit in Science 100 will be considered equivalent to BIOL 107, 108, CHEM 101, EAS 100, 105, MATH 113, 115, PHYS 144 and 146, for students entering Paleontology Honors.

193.14.2 Specialization in Paleontology

Continuation in the Specialization in Paleontology program requires a GPA of at least 2.3 on at least ★18 in each preceding Fall/Winter. To graduate in four years, a student needs to complete ★30 per year. Students who extend their programs beyond five years must first obtain the written approval of the Faculty of Science and the Department of Earth and Atmospheric Sciences. Graduation requires a GPA of at least 2.3 on the last ★60 credited to the degree. A student enrolling in the Specialization program should consult the Paleontology program student advisor before registration each year.

Year 1

BIOL 107 and 108
CHEM 101 or 164
EAS 100, 105 and 110
★6 junior English
MATH 113 or 114 or 120
STAT 151

Year 2

ANTHR 209
BIOL 207 and 208
BOT 210
EAS 222, 230, 233 and 234
★3 approved Arts option
★3 approved Science option

Year 3

BIOL 321 and 335
EAS 336
PALEO 414 or BOT 411
ZOOL 224, 250 and 325
★6 approved Arts options
★3 approved Science option

Year 4

ANTHR 390 and 391
PALEO 414 or BOT 411
PALEO 400, 418 and 419
★12 approved Science options

Notes:

(1) PALEO 414 is offered in alternate years but must be taken in Year 3 or 4. Approved Science options: BIOL 315, 361, 364; EAS 207, 224, 250, 460, 462, 465; ENT 220; ZOOL 405, 407, 408, 427. Arts options: ANTHR 391; CHRTC 350, 451; PHIL 265, 317. For information regarding additional approved options, please consult your Department advisor.
(2) Credit in Science 100 will be considered equivalent to BIOL 107, 108, CHEM 101, EAS 100, 105, MATH 113, 115, PHYS 144 and 146, for students entering Paleontology Specialization.

193.15 Pharmacology

193.15.1 Honors in Pharmacology

The program leading to an Honors degree in Pharmacology prepares students for advanced study leading to academic or research careers.

Continuation and graduation from the Honors Pharmacology program requires a minimum GPA of 3.3 on at least ★30, and a minimum GPA of 3.3

in all science courses taken, and a grade of B+ in each course taken in the Department of Pharmacology during the preceding Fall/Winter.

Year 1

BIOL 107, 108
CHEM 101, 102, 164 or 261
★6 in Arts options ENGL recommended
STAT 141 or 151
★6 in Science options from BIOCH, BIOL, CHEM, GENET, MATH, MICRB, PHYS, PHYSL, PMCOL, STAT or ZOOL

Year 2

BIOCH 200
CHEM 211, 213, 263
PHYSL 210 or 211
PMCOL 201, 202
★6 in Arts options

Year 3

PMCOL 303, 305, 343, 344
BIOCH 320, 330
★3 in Science options as indicated in Year 1
★3 in Arts options
★6 in approved options

Year 4

PMCOL 337, 498
★3 in approved options
★3 in Science option as indicated in Year 1
★15 from the following: PMCOL 412, 415, 416, 425, 442, 475

Note: Students must consult the Chair of the Department or designee for approval of the selection of options. Students will not be permitted to take 400-level pharmacology courses unless all prerequisites have been met.

Recommended Science options: BIOCH 310, 410, 420, 430, 441, 450, CHEM 313, 419, GENET 270, 301, 304, 390, 408, MATH 113, or 114 and 115, PHYSL 372, 401, 402, 403, 404, PMCOL 371, STAT 252.

193.15.2 Specialization in Pharmacology

The program leading to a Specialization degree in Pharmacology is for students who want to pursue further studies in the health sciences and those who want to prepare for a career in the Pharmaceutical industry. Although not as rigorous as an Honors program, the Specialization program is a solid background for advanced study leading to a career in academia or research.

Continuation and graduation from the Specialization program in Pharmacology require a minimum GPA of 2.7 in the preceding Fall/Winter. In addition, a GPA of at least 2.7 is required in all Science courses taken and a minimum GPA of 2.7 is required in all courses in the Department of Pharmacology.

Year 1

BIOL 107, 108
CHEM 101, 102, 164 or 261
★6 in Arts options ENGL recommended
STAT 141 or 151
★6 in Science options from BIOCH, BIOL, CHEM, GENET, MATH, MICRB, PHYS, PHYSL, PMCOL, STAT or ZOOL

Year 2

BIOCH 200
CHEM 211, 213, 263
PHYSL 210 or 211
PMCOL 201, 202
★6 in Arts options

Year 3

PMCOL 303, 305, 343, 344
BIOCH 320, 330
★3 in Science options as indicated in Year 1
★3 in Arts options
★6 in approved options

Year 4

PMCOL 337
★15 from PMCOL 412, 415, 416, 425, 442, 475
★3 in Science options as indicated in Year 1
★3 in Arts options
★6 in approved options

Note: Students must consult the Chair of the Department or designee for approval of options. Students will not be permitted to take 400-level pharmacology courses unless all prerequisites have been met.

Recommended Science options: BIOCH 310, 410, 420, 430, 441, 450, CHEM 313, 419, GENET 270, 301, 304, 390, 408, MATH 113, or 114 and 115, PHYSL 372, 401, 402, 403, 404, PMCOL 371, STAT 252.

193.15.3 Industrial Internship Program

An Industrial Internship Program, similar to a co-op program, is offered to students in the Specialization or Honors programs in Pharmacology (see §193.1.9 for guidelines to the program). The Industrial Internship designation will appear on the degree parchments of students who have participated in the program.

Students approved to enter this stream register for a continuous sequence of Science Work Experience courses (WKEXP 955, 956, 957, 958), starting in May, September or January. During the program, students are considered full-time students of the University. Work experience courses have no weight and are graded credit/no credit, and recorded on the student's transcript.

The Industrial Internship Program Advisor maintains contact at regular intervals with the student and the person designated by the employer to be responsible for the student's progress. This arrangement ensures satisfaction on all sides. If a review shows the situation is not satisfactory, the internship may be terminated and the student will then return to classes at the next available opportunity.

The graduation requirements for the Industrial Internship program designation include successful completion of at least WKEXP 955 and 956 plus PMCOL 400. PMCOL 400 must be taken in the first term immediately following completion of the WKEXP period. If required by the employer, the student's written report and oral presentation in PMCOL 400 may be classified confidential. The employer also assesses the student's performance during the work term. Based on the student's written report and oral presentation, and the report from the employer, students are awarded a grade in PMCOL 400.

Interested students should see the Industrial Internship Advisor in the Department of Pharmacology for more information.

193.16 Physics

The Honors Programs offered by the Department of Physics provide a comprehensive education for students planning advanced degrees and a research or academic career.

Continuation in the Honors Physics, including the Applied Physics, Astrophysics, Computational Science (Physics), Geophysics and Mathematical Physics, programs requires a GPA of 3.0 on at least ★24 in the preceding Fall/Winter. Graduation requires a GPA of 3.0 on the last ★90 credited to the degree.

The Specialization programs provide greater flexibility for students who want a four-year degree in Physics or Geophysics without the full comprehensive training of the Honors Programs. Continuation in the Specialization program in Astrophysics, Computational Science (Physics) and Geophysics requires a GPA of at least 2.3 in the preceding Fall/Winter. Graduation requires a GPA of 2.3 on the last ★90 credited to the degree.

Notes

(1) Students interested in the Engineering-Physics program should consult §82.7 of the Faculty of Engineering section.
(2) Honors and Specialization Physics students must consult an advisor in the Department of Physics regarding their programs. Note to second-, third- and fourth-year students: Not all 200-, 300- and 400-level Physics and Geophysics courses are offered every year.

193.16.1 Honors in Physics

Notes

(1) By the end of their programs, students must have taken ★18 of Arts options.
(2) **PH Pool A options:** All 400-level ASTRO; PHYS 415, 485, 495.
(3) **PH Pool B options:** All 400-level MA PH; all 400-level MATH; PHYS 458, 467.
(4) **PH Pool options:** ASTRO 320, 322; EAS 370, 371, 373; all 300- and 400-level GEOPH; PHYS 364; all 400-level PHYS; all courses in Pool A and Pool B. Other courses may be taken by prior consent of the Department of Physics.

Year 1

MATH 113 (or 114, or 117), 115 (or 118)
MATH 120 (or 125 or 127)
PHYS 144, 146
★6 in Science options
★9 in Arts options (see Note 1 above)

Year 2

MATH 214 (or 217), 215 (or 317), 225 (or 227)
PHYS 234, 244, 271, 281, 295, 297
★3 in an Arts option (see Note 1 above)

Year 3

MATH 311 (or 411), 334, 337
PHYS 310, 311, 362, 372, 381, 397
★3 in an Arts option (see Note 1)

Year 4

MA PH 343
PHYS 472, 481, 499
★3 in PH Pool A options (see Note 2)
★3 in PH Pool B options (see Note 3)
★9 in PH Pool options (see Note 4)
★3 in an Arts option (see Note 1)

193.16.2 Honors in Astrophysics

Notes

(1) Students must take a total of ★18 in Arts options.
(2) **AH Pool:** EAS 370, 371, 373; all 300-level GEOPH courses; PHYS 364, 397; all 400- level ASTRO, GEOPH, PHYS, MA PH, and MATH courses. Other courses may be taken with prior consent of Department.

Year 1

MATH 113 (or 114 or 117), 115 (or 118), 120 (or 125 or 127)
PHYS 144, 146
★ 6 in Science options (recommended options are ASTRO 120 and 122)
★ 9 in Arts options

Year 2

ASTRO 320
MATH 214 (or 217), 215 (or 317), 225 (or 227)
PHYS 234, 244, 271, 281, 295, 297

Year 3

ASTRO 322
MATH 311, 334, 337
PHYS 310, 311, 362, 372, 381
★ 3 Arts option

Year 4

★6 from ASTRO 429, 430, 465
MA PH 343
PHYS 458, 472, 481, 499
★ 3 in AH Pool option (see Note 2)
★ 6 in Arts options

193.16.3 Honors in Geophysics

Notes

(1) In addition to the specific courses listed in the program, students must take ★12 in Approved Science options, and ★12 in Arts options.
(2) Suggested approved Science options: ASTRO 429; EAS 221, 224, 320, 323, 324, 422, 424, 425, 430, 433; GEOPH 223, 332, 431, 440; MIN E 323; PET E 365, 473, 477; PHYS 308, 310 (recommended), 499; STAT 141 (or 151). Students in Geophysics will not have the formal prerequisites for many of the EAS, MIN E, and PET E courses, and must get prior approval to register in those courses from the department offering the particular course.
(3) Not all 300-level and 400-level courses are offered every year. Students must consult the Department of Physics for approval of third- and fourth-year programs.
(4) Students entering this program after first year may take GEOPH 210 in lieu of GEOPH 110. However, students will not receive credit for both GEOPH 110 and 210.

Year 1

CHEM 101, 102
GEOPH 110
MATH 113 (or 114 or 117), 115 (or 118), 120 (or 125)
PHYS 144, 146
★6 in Arts options (English recommended)

Year 2

EAS 210
EAS 233
MATH 214 (or 217), 215 (or 317)
PHYS 234, 244, 271, 281, 295
★3 in an Arts option (see Note 1 above)

Year 3

EAS 222, 421
GEOPH 325, 326
MATH 311 (or 411), 334, 337
PHYS 381
★6 in approved Science options (see Note 2 above)

Year 4

GEOPH 421, 424, 426, 436, 438
PHYS 467, 481
★6 in approved Science options (see Note 2 above)
★3 in an Arts option (See Note 1 above)

193.16.4 Honors in Mathematical Physics

Notes

(1) MPH Senior Science options: any 300- or 400-level course offered by the Faculty of Science.
(2) MPH Pool courses: PHYS 362, 364, 397; all 300- and 400-level ASTRO and GEOPH courses; all 400-level MA PH, MATH and PHYS courses. Other courses may be taken with prior consent of Department.

Year 1

MATH 117, 118, 125 or 127
PHYS 144, 146
★6 in Science options
★9 in Arts options

Year 2

MATH 217, 225 or 227, 317
MATH 334
PHYS 234, 244, 271, 281, 295
★3 in Arts option

Year 3

MATH 311 (or 411), 337
MA PH 343
PHYS 310, 311, 372, 381
★3 in MPH Senior Science options (see Note 1)
★6 in Arts option

Year 4

MATH 417
MA PH 451
PHYS 458, 472, 481, 499
★12 in MPH Pool courses (see Note 2)

193.16.5 Specialization in Physics

Notes

(1) By the end of their programs, students must have taken ★18 of Arts options.
(2) PS Senior Science options: Any 200- or higher level course offered by the Faculty of Science.
(3) PS Pool A: PHYS 301, 362, 364, all 300- and 400-level ASTRO, GEOPH, MA PH, and MATH courses; all 400-level PHYS courses. Other courses may be taken with prior consent of Department.
(4) PS Pool B: all 400-level ASTRO, GEOPH, MA PH, and PHYS. Other courses may be taken with prior consent of Department.

Year 1

MATH 113 (or 114 or 117), 115 (or 118), 120 (or 125 or 127)
PHYS 144, 146
★6 in Science options
★9 in Arts options (see Note 1 above)

Year 2

MATH 214 (or 217), 215 (or 317), 225 (or 227)
PHYS 234, 244, 271, 281, 295, 297
★3 in an Arts option (see Note 1 above)

Year 3

MATH 334, 337
PHYS 310, 311, 372, 381, 397
★3 in Arts options (see Note 1)
★3 in PS Senior Science option (see Note 2)
★3 in PS Pool A option (see Note 3)

Year 4

★6 in PS Senior Science options (see Note 2)
★15 in PS Pool A options (see Note 3)
★6 in PS Pool B options (see Note 4)
★3 in Arts option (see Note 1)

193.16.6 Specialization in Astrophysics

Notes

(1) Students must take a total of ★18 in Arts options.
(2) **AS Senior Science options:** Any 200-, 300-, or 400-level course offered by the Faculty of Science.
(3) **AS Pool options:** PHYS 301, 362, 364, 397; all 300- and 400-level GEOPH, MA PH, MATH, and PHYS courses; all 400- level ASTRO courses. Other courses may be taken with prior consent of Department.

Year 1

MATH 113 (or 114 or 117), 115 (or 118), 120 (or 125 or 127)
PHYS 144, 146
★6 in Science options (recommended options are ASTRO 120 and 122)
★9 in Arts options

Year 2

ASTRO 320
MATH 214 (or 217), 215 (or 317), 225 (or 227)
PHYS 234, 244, 271, 281, 295, 297

Year 3

ASTRO 322
MATH 334, 337
PHYS 310, 311, 372, 381
★3 in AS Senior Science option (see Note 2)
★3 in AS Pool option
★ 3 Arts option

Year 4

★ 6 from ASTRO 429, 430, 465
★ 6 in AS Senior Science options (see Note 2)
★ 12 in AS Pool options (see Note 3)
★ 6 in Arts options

193.16.7 Specialization in Geophysics

Notes:

(1) In addition to the specific courses listed in the program, students must take a minimum of ★3 from specialization Pool B, ★6 from specialization Pools A or B, ★12 in Approved Science options, and ★12 in Arts options.

(2) **Specialization Pool A courses:** ASTRO 429; EAS 221, 320, 323, 324, 425, 430, 433; GEOPH 332, 421, 431, 440; MIN E 323; PET E 365, 473, 477; PHYS 308, 499. Students in Geophysics will not have the formal prerequisites for many of the EAS, MIN E, and PET E courses, and must get prior approval to register in those courses from the department offering the particular course. GEOPH courses are recommended.

(3) **Specialization Pool B courses:** EAS 224, GEOPH 223, PHYS 261, 310 (recommended), 362, 420, 467, STAT 141 (or 151),

(4) Not all 300-level and 400-level courses are offered every year. Students must consult the Department of Physics for approval of third- and fourth-year programs.

(5) Students entering this program after first year may take GEOPH 210 in lieu of GEOPH 110. However, students will not receive credit for both GEOPH 110 and 210.

Year 1

CHEM 101, 102
GEOPH 110
MATH 113 (or 114 or 117), 115 (or 118), 120 (or 125)
PHYS 144, 146
★6 in Arts options

Year 2

EAS 210
EAS 233
MATH 214 (or 217), 215 (or 317)
PHYS 234, 244, 271, 281, 295
★3 in an Arts option (see Note 1 above)

Year 3

EAS 222
GEOPH 325, 326
MATH 311 (or equivalent), 334, (or 201 or equivalent), 337 (or 300 or equivalent)
PHYS 381
★9 in approved Science options or Specialization Pools A or B courses (see Notes 1, 2 and 3)

Year 4

GEOPH 424, 426, 436, 438
EAS 421
★12 in approved Science options or Specialization Pools A or B courses (see Notes 1, 2 and 3)
★3 in Arts option (see Note 1 above)

193.16.8 Industrial Internship Program

An Industrial Internship Program, similar to a co-op program, is offered to students in the Specialization or Honors programs in Physics (see §193.1.9 for guidelines to the program). The Industrial Internship designation will appear on the degree parchments of students who have participated in the program.

Students approved to enter this stream register for a continuous sequence of Science Work Experience courses (WKEXP 955, 956, 957, 958), starting in May, September or January. During the program, students are considered full-time students of the University. Work experience courses have no weight and are graded credit/no credit, and recorded on the student's transcript. The Industrial Internship Program Advisor maintains contact at approximately three-month intervals with the student and the person designated by the employer to be responsible for the student's progress. This arrangement ensures satisfaction on all sides. If the review shows the situation is not satisfactory, the internship may be terminated and the student would then return to classes at the next available opportunity. The graduation requirements for the Industrial Internship program designation include successful completion of at least WKEXP 955 and 956 plus PHYS 400. PHYS 400 must be taken in the first term immediately following completion of the WKEXP period. If required by the employer, the student's written report and oral presentation in PHYS 400 may be classified confidential. The employer also assesses the student's performance during the work term. Based on the student's written report and oral presentation, and the report from the employer, students are awarded a grade in PHYS 400.

Interested students should see the Industrial Internship Advisor in the Department of Physics for more information.

193.16.9 Concentration in Physics

Students considering Physics as their major subject of concentration in the four-year General BSc program should include PHYS 124/126 or 144/146, and 208 and 224 as early as possible in their program. To complete a major in Physics, PHYS 294 is strongly recommended. Students majoring in Physics should normally select from ASTRO 320, 322, PHYS 301, 308, and 364. They should also consult the Physics Department about course offerings, as not all 200- and 300-level PHYS courses are offered each year. Students wishing to combine a major in Physics with a minor in Arts or Business should consult a Faculty of Science advisor (§§193.1.3 and 193.1.5).

193.17 Physiology

193.17.1 Honors in Physiology

Honors in Physiology is offered by the Department of Physiology in the Faculty of Medicine and Dentistry through the Faculty of Science.

The Honors program is designed to prepare students for advanced study leading to careers in academia, industrial research, or for entry into health-related professions. A choice of courses is available for students with interests in particular branches of the life sciences (e.g., cell and molecular biology, endocrinology, cardiovascular physiology, and neurobiology).

Entry into the Honors Program from high school requires a minimum matriculation average of 80% with Biology 30, Chemistry 30 and Physics 30, as prerequisites. Continuation in the program requires a GPA of 3.3 on at least ★30 in the previous Fall/Winter term. In addition, students in the second year of the program must obtain a grade of at least B in each of PHYSL 212 and 214 in order to continue in the program. Students who are eligible to enter the program in their third year and have credit in PHYSL 210 require a grade of at least A in PHYSL 210. Graduation requires a GPA of 3.3 in the final year. Students must consult their advisor in the Department prior to registration in each year of the program.

The course requirements for the program are as follows:

Year 1

BIOL 107, 108
CHEM 101, 102, 164 (or 261), 263 (see Note 8)
★6 junior English
★6 in approved Science or Arts options (see Notes)

Year 2

BIOCH 200
BIOL 201, 207
PHYS 124, 126
PHYSL 212, 214 (see Note 9)
PMCOL 201
★6 in approved Science or Arts options (see Notes)

Year 3

BIOCH one of 310, 320 or 330
CELL 300
PMCOL 343 and 344, 371
PHYSL 372, 401, 403
PMCOL 202, 371
STAT 141 or 151
★6 in approved Science or Arts options (see Notes)

Year 4

PHYSL 402, 404, 465, 466 (or 467 in place of 465/466)
★12 from CELL 445; NEURO 443, 496; PHYSL 400, 405, 444, 501, 512, 513, 527, PHYSL 545 or BIOL 545; PMCOL 415, 515, or another 400- or 500- level Science course with consent of the Department
★6 in approved Science or Arts options (see Notes)

Notes

(1) The program must consist of a minimum of ★90 in Science, a minimum of ★18 in Arts, and no more than ★12 in non-Arts/non-Science options and no more than ★42 in junior (100- level) courses.
(2) Suggested Science options must be chosen from the following: Junior Courses: CMPUT 114, 174; MATH 113 or 114, 115, 120 or 125; PSYCO 104. Advanced Courses: BIOCH 420, 430, 441, 450, 455, 460; BIOL 315; CELL 301; CHEM 211, 213, 361; GENET 270, 275, 301, 302, 304, 375, 390, 418; IMIN 200, 324, 371, 452; MATH 214, 215; MICRB 265; MMI 351, 520; PMCOL 305, 403, 407, 412, 415, 505, 508; PSYCO 275, 281, 371, 377, 381, 459, 478; STAT 252, 368; ZOOL 225, 303, 340, 342, 343, 402.
(3) Suggested Arts options: CHRTC 352; CLASS 294; LING 321, 323, 499; PHIL 101, 250, 265, 415, 417; POL S 101; PSYCO 105, 223, 258; SOC 100, 241, 382, 473; WRITE 298.
(4) Approved non-Arts/non-Science options: ANAT 200; AN SC 310, 311, 410, 484; BME 513; NUTR 301, 302; OCCTH 206; PSYC 511. (There is no requirement to take any non-Arts/non-Science courses).
(5) Other options may be acceptable with written permission of an advisor.
(6) MATH 113 or 114 is a recommended option.
(7) Honors students are also encouraged to attend all department seminars.
(8) Honors students in the first year of the program who are unable to take CHEM 164 may take CHEM 263 in second year.
(9) Honors students in the second year of the program are required to take PHYSL 212 and 214.

193.18 Psychology

193.18.1 Honors in Psychology

The Department offers courses leading to the degrees of BSc and BA with Honors in Psychology. Students wishing to emphasize the physical, biological, and mathematical sciences should enrol in the BSc program; those wishing to emphasize the humanities and social sciences should enrol in the BA program. Either program is appropriate for students considering postgraduate training in psychology or in other fields that require these research skills.

Admission into the Honors program is permitted only at the end of the second year (after completion of ★60). Final acceptance into the Honors program is dependent upon obtaining approval from a potential research supervisor prior to August 7.

Continuation in and graduation from the Honors Psychology program require a minimum GPA of 3.3 in the preceding Fall/Winter. Students are expected to take at least ★30 during the Fall/Winter of each year of study, including the first and second years. Exceptions to this requirement must be approved by both the Department of Psychology and the Faculty of Science. A minimum of ★48 (but no more than ★60) must be taken in Psychology. A minimum of ★72 in science courses must be taken. A student's program of courses must be approved in advance each year by the Honors Psychology advisor.

Note: The required courses noted in Year 1 and Year 2 below must be taken during the first two years of study.

Year 1

BIOL 107, 108
One of ENGL 111, 112, 113, 114
PSYCO 104, 105
★6 from CMPUT 101, 114, 115, MATH 113, 114, 115, 117, 118, 120, 125, STAT 252 or other Computing Science, Mathematics or Statistics course approved by the Honors Advisor. (Note: STAT 141 or 151, a requirement in Year 2, is a prerequisite to STAT 252).
★6 in approved Science options

Year 2

STAT 141 or 151 and PSYCO 212
★6 (two of) from PSYCO 223, 233, 241, 258
★6 (two of) from PSYCO 267, 275, 281
★6 from approved courses offered by the Departments of Anthropology, Economics, Linguistics, Political Science and/or Sociology
★6 in approved Science options

Year 3

PSYCO 309, 390 and PSYCO 303 or 304
★3 (one of) PSYCO 356, 410, 411, 413, 431, 475, 476, 482, or other advanced research methods course approved by the Honors Advisor
★9-12 in approved Science options
★6-9 in approved options

Year 4

PSYCO 409, 499
★6 (two of) in a 400-level Psychology course other than 409, 410, 411, 413, 431, 475, 476, 482, 499, 496, 497, 498, except as approved by the Honors Advisor
★9-15 in approved Science options
★3-9 in approved options

Notes

(1) In addition to the courses specifically listed above, the program must include, among the student's optional courses, a minimum of ★12 in one or more disciplines relevant to Psychology, e.g., ANTHR, BIOL, CHEM, CMPUT, ECON, GENET, LING, MATH, NEURO, PHIL, PHYS, PHYSL, PMCOL, POL S, SOC, STAT, ZOOL. These courses may not overlap those used to fulfil the Computing/Mathematics/Statistics, Natural Science and Social Science requirements listed above.
(2) Under the supervision of a faculty member in the Department of Psychology, students undertake a year-long research apprenticeship (PSYCO 390) during the third year and conduct and write an empirical thesis (PSYCO 490) during the fourth year. Third-year students present their thesis research proposals, and fourth-year students present the results of their thesis research at the annual Honors Psychology Conference in April.

193.18.2 Specialization in Psychology

Continuation in the Specialization in Psychology program requires a minimum GPA of 2.3 in the preceding Fall/Winter. Graduation requires a minimum GPA of 2.3 on all courses credited to the degree.

Year 1

BIOL 107, 108
PSYCO 104, 105
★6 in a English course (one of ENGL 111, 112, 113, 114 is recommended)
★6 from junior courses offered in the departments of Computing Science and Mathematics
★6 from junior courses offered in the departments of Chemistry and Physics

Year 2

STAT 141 OR 151
★6 from PSYCO 223, 233, 241, 258
★6 from PSYCO 267, 275, 281
★15 in approved options

Year 3

★6 from 300 level or above Arts Psychology courses
★6 from 300 level or above Science Psychology courses
★18 in approved options

Year 4

★30 in approved options

To fulfill the degree requirements, students must complete a minimum of ★36 in Psychology courses. At least ★6 must be at the 400 level. A minimum of ★72 in Science is required (see section 193.1.2).

193.18.3 Industrial Internship Program

An Industrial Internship Program, similar to a co-op program, is offered to students in the Specialization or Honors programs in Psychology (see §193.1.9 for guidelines to the program). The Industrial Internship designation will appear on the degree parchments of students who have participated in the program.

Students who have completed the third year of their program and who are approved to enter this stream register for a continuous sequence of Science Psychology Work Experience courses (WKEXP 931, 932, 933, 934) starting in May or September. During the program, students are considered full-time students of the University. Work experience courses have no weight and are graded credit/no credit, and recorded on the student's transcript; students are not permitted to register in any academic courses during the Industrial Internship Program. The Industrial Internship Program Advisor maintains contact at approximately three-month intervals with the student and the person designated by the employer to be responsible for the student's progress. This arrangement ensures satisfaction on all sides. If the review shows the situation is not satisfactory, the internship may be terminated and the student would then return to classes at the next available opportunity. The graduation requirements for the Industrial Internship program designation include successful completion of at least WKEXP 931 and 932 plus PSYCO 410. PSYCO 410 must be taken in the first term immediately following completion of the WKEXP period. If required by the employer, the student's written report and oral presentation in PSYCO 410 may be classified confidential. The employer also assesses the student's performance during the work term. Based on the student's written report and oral presentation, and the report from the employer, students are awarded a grade in PSYCO 410.

Interested students should see the Industrial Internship Advisor in the Department of Psychology for more information.

193.19 Statistics

193.19.1 Honors in Statistics

Continuation in the Honors in Statistics program requires a GPA of 3.0 on at least ★24 in the preceding Fall/Winter.

Graduation requires a GPA of 3.3 on all Statistics and Mathematics courses taken and a GPA of 2.7 on the last ★30 credited to the degree.

The program must contain the following courses, which should be taken in the years indicated:

Year 1

CMPUT 101 and 114, or 114 and 115
MATH 125 (or 127)
MATH 114 (or 117), 115 (or 118)
STAT 151
★6 in approved Arts options
★6 in approved options

Year 2

MATH 214 (or 217), 215 (or 317), 225 (or 227)
STAT 265
★6 in approved Arts options
★9 in approved Science options
★3 in an approved option

Years 3 and 4

MATH 314 or 417
MATH 414 or 418
STAT 312, 366, 378, 471
Two of STAT 335, 361, 368, 377
Three of STAT 432, 441, 453, 454, 472, 479
★6 in approved Arts options
★21 in approved Science options

Notes

(1) At least ★9 in approved options in one distinct field of application must be taken at the 300-level or higher. Examples of fields of applications are Biology, Business, Computing Science, Economics, Engineering, Pharmacology, Political Science, Psychology, and Sociology. Students should plan to take the proper prerequisites early in the program.

(2) Students interested in taking non-junior CMPUT courses as options in subsequent years should note that CMPUT 115 or 175 is a prerequisite for most non-junior CMPUT courses.

Honors in Mathematics

See §193.11.1 for details.

193.19.2 Specialization in Statistics

The Specialization program in Statistics is for students interested in applying Statistics to a second discipline. Students in this program must choose one distinct field of application. Recommended fields of application are Agriculture, Chemical Engineering, Computing Science, Economics, Education, Genetics, Health Sciences Administration, Pharmacology, Political Science, Psychology, Sociology, and Zoology. Students may, in consultation with the Department of Mathematical and Statistical Sciences, select a different field of application than those listed above.

Continuation in the program normally requires, successful completion of at least ★24 in the previous Fall/Winter, with a GPA of at least 2.3, and a GPA of at least 2.3 on the aggregate of all MATH and STAT courses taken in that Fall/Winter.

In the last Fall/Winter of the Program a GPA of at least 2.3 and a GPA of at least 2.3 on the aggregate of all MATH and STAT courses taken in that Fall/Winter is required.

Graduation requires a GPA of at least 2.3 on all courses credited toward the degree and a GPA of at least 2.3 on the aggregate of all MATH and STAT courses credited toward the degree.

The program must contain the following courses. It is recommended that these courses be taken in the years indicated.

Year 1

MATH 114, 115, 125
STAT 151
★18 in options (see Note 2 below)

Year 2

MATH 214, 215, 225
STAT 252, 265
★15 in options (see Note 2 below)

Years 3 and 4

STAT 361, 366, 368, 378
★12 in STAT options at 300- and 400-level
★36 in options

Notes

(1) Each student's program must have the approval of the Department of Mathematical and Statistical Sciences.

(2) The program must include ★6 in English and either CMPUT 101 and 114, or CMPUT 114 and 115 or CMPUT 174 and 175. These courses should be taken in the first two years of the program.

(3) The program must include at least ★18 in a single field of applications. The student is advised to consult the Department of Mathematical and Statistical Sciences regarding specific program recommendations for the field of applications.

(4) The program must meet the requirements of the Faculty of Science (§193.1.2) and include ★18 in Arts courses.

(5) A corresponding Honors MATH course can be substituted for any MATH course listed. For example, MATH 117 can be substituted for MATH 114.

(6) Students interested in taking non-junior CMPUT courses as options in subsequent years should note that CMPUT 115 or 175 is a prerequisite for most non-junior CMPUT courses.

193.19.3 Industrial Internship Program

The Industrial Internship program provides students who have finished their third year in the Department of Mathematical and Statistical Sciences an opportunity for extended work experience. The program lasts 8-16 months, and, after completing the reporting requirements, a student can receive university credit for the experience.

A student must successfully complete at minimum WKEXP 955 and 956, STAT 400, and the final year of their academic program to graduate with the Industrial Internship designation.

This program should be of particular interest to Mathematics students studying Actuarial Science, Applied Mathematics, Economics, Finance, or Statistics.

Students' participation in the program is voluntary. Although the Department makes every effort to find suitable employment, it is not possible to guarantee that all interested students can do an internship. Students should contact the Industrial Internship program coordinator in the Department of Mathematical and Statistical Sciences for further information.

194 Details of Courses

194.1 Course Listings

Science courses can be found in §231, Course Listings, under the following subject headings:

Astronomy (ASTRO)
Biochemistry (taught by the Faculty of Medicine and Dentistry) (BIOCH)
Biochimie (BIOCM) (Faculté Saint-Jean)
Biological Science - Biology (BIOL)
Biological Science - Botany (BOT)
Biological Science - Entomology (ENT)
Biological Science - Genetics (GENET)
Biological Science - Microbiology (MICRB)
Biological Science - Zoology (ZOOL)
Biologie (BIOLE) (Faculté Saint-Jean)
Cell Biology (CELL)
Chemistry (CHEM)
Chimie (CHIM) (Faculté Saint-Jean)
Computing Science (CMPUT)
Earth and Atmospheric Sciences (formerly Geography and Geology (EAS)
Environmental Physical Sciences (ENVPS)
Geophysics (GEOPH)
Immunology and Infection (IMIN)
Interdisciplinary Studies (INT D)
Laboratory Animal Management (LB AN)
Marine Science (MA SC)
Mathematical Physics (MA PH)
Mathematics (MATH)
Mathématiques (MATHQ) (Faculté Saint-Jean)
Neuroscience (taught by the Faculty of Medicine and Dentistry) (NEURO)
Paleontology (PALEO)
Pharmacology (taught by the Faculty of Medicine and Dentistry) (PMCOL)
Physiology (taught by the Faculty of Medicine and Dentistry) (PHYSL)
Physics (PHYS)
Physique (PHYSQ) (Faculté Saint-Jean)
Psychology (PSYCO)
Sciences de la Terre et de l'atmosphére (SCTA) (Faculté Saint-Jean)
Statistics and Applied Probability (STAT)
Statistique (STATQ) (Faculté Saint-Jean)

194.2 Prerequisites

Where a prerequisite is stated in a course description, it is understood that equivalent courses may satisfy the requirement. Also, the department offering a course with prerequisite requirements may waive the prerequisite in writing. (Prerequisite waiver forms are available from the Faculty of Science office and the Department offices.)

194.3 Biochemistry Courses

The following courses can be used by students in the Faculty of Science as science courses: BIOCH 200, 310, 320, 330, 401, 420, 430, 441, 450, 455, and 460.

194.4 Computing Science Courses

Introductory

The following courses are considered introductory: CMPUT 101, 114, 115, 174 and 175. Specific course details are in Course Listings (§231).

194.5 Food Science Courses

NU FS 363 may be used by students in the Faculty of Science as a science course in Microbiology.

194.6 Medical Microbiology Courses

The following courses may be used by students in the Faculty of Science as science courses MMI 351, 352. MMI 499 may be used by students in the Immunology and Infection program as a science course.

194.7 Pharmacology Courses

The following courses may be used by students in the Faculty of Science as science courses: PMCOL 201, 202, 303, 305, 337, 343, 344, 371, 400, 401, 402, 407, 412, 415, 416, 425, 442, 475 and 498.

194.8 Physiology Courses

The following may be used by students in the Faculty of Science as science courses: PHYSL 210, 212, 214, 372, 401, 402, 403, 404, 444, 465 and 466. Senior undergraduate students may use certain 500-level courses with the permission of the department advisor.

194.9 Graduate Courses

Courses numbered 500 and up are restricted to graduate students and normally may not be taken for credit by undergraduate science students.