Faculty of Science

191 The Professors

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Registrar of the University
LM Collins

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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 Applied Mathematics, Atmospheric Sciences, Astrophysics, Biochemistry, Bioinformatics, Biological Sciences (Animal Biology, Ecology, Evolutionary Biology, Microbiology, Molecular Genetics, Physiology and Developmental Biology, Plant Biology), Chemistry, Cell Biology, Computing Science, Computing Science with Business Minor, Computing Science Specialization Stream in Bioinformatics, Environmental Earth Sciences, Geology, Geophysics, Immunology and Infection, Mathematical Physics, Mathematics, Mathematics (Computational Science) 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 program.

A Science Internship Program (SIP) is available to Faculty of Science BSc students to enhance their studies and provide relevant work experience. Students must complete an 8-, 12- or 16- month work experience term at the end of their third year to receive SIP designation on their degree parchment. For more details, please see §192.11.

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, followed by descriptions of each degree program under the subject headings in §194.

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 §16.15.

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 (Fall) and January to April (Winter). In Spring/Summer, the instructional periods of May/June (Spring) and July/August (Summer).

(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) **Spring/Summer**

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

(15) **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

(1) Academic standing is used to determine the eligibility of students to continue or graduate from their programs. The academic standing of all students in the Faculty of Science is assessed annually on the basis of the Grade Point Average (GPA) calculated on all **coursework attempted in the Fall/Winter**. Spring and Summer work is not included. The assessment of students in BSc Specialization and BSc Honors programs also takes into consideration the minimum course load requirements of the particular program, as well as any specific grade or GPA requirements.

For students in the BSc General program, the Faculty may defer the assessment of academic standing for one Fall/Winter for students who attempt less than ★9. In such cases, the academic standing assigned at the last assessment remains in effect until the conclusion of the next Fall/Winter.

(2) **Academic Standing Assessment**

a. **First Class Standing**, also referred to as the Dean's Honor Roll, is assigned to students who successfully complete at least ★24 and achieve a minimum 3.5 GPA. First class standing is also assigned to

students who, as a result of participation in Education Abroad or IIP Work Experience, attend only one term of a Fall/Winter and successfully complete at least ★12 with a minimum 3.5 GPA.

b. **Satisfactory Standing** is assigned to students in the BSc General program who achieve a minimum GPA of 2.0. Satisfactory standing is assigned to students in BSc Specialization and BSc Honors programs who meet the minimum continuation requirements for their program, including Fall/Winter GPA, course load and any course specific grade or GPA requirements. (Refer to the specific sections covering each BSc Specialization and BSc Honors program in §193.2 to §194.17.2.)

Students in satisfactory standing may continue in their programs.

c. **Marginal Standing** is assigned to students with a GPA between 1.7 and 1.9 on a minimum ★9 attempted. Students meeting these criteria who do not have in their postsecondary education a prior requirement to withdraw, an academic warning, a probation period or their equivalents may be permitted to continue on academic warning in the BSc General program. Students in BSc Honors and BSc Specialization programs who meet the criteria for marginal standing may not continue in their current programs, but must apply to transfer to the BSc General program in order to continue on academic warning.

To clear academic warning and return to satisfactory standing, students must attend the subsequent Fall/Winter and must obtain a minimum 2.0 GPA. Students who fail academic warning are required to withdraw.

Students who have been placed on academic warning and wish to interrupt their studies must obtain the written permission of the Associate Dean, Undergraduate prior to August 15 of the year in which marginal standing was assigned. Students who interrupt their studies without permission will need to requalify in order to be considered for future readmission [see §192.5(3)c.].

Academic warning may be offered once only. To remain in satisfactory standing students must maintain a minimum 2.0 GPA in all subsequent Fall/Winters. Students with a GPA below 2.0 and who have in their postsecondary education a prior requirement to withdraw, an academic warning, a probation period or their equivalents are required to withdraw.

Academic warning is not offered to Special Students or to students in BSc Specialization and Honors After Degree programs who are upgrading a previous degree with a major in the same discipline. Students in these programs with marginal standing will be required to withdraw.

d. **Unsatisfactory Standing** is assigned to students whose GPA on a minimum ★9 is below 1.7. It is also assigned to students with a GPA below 2.0 who have in their postsecondary education a prior requirement to withdraw, an academic warning, a probation period or their equivalents. Students with unsatisfactory standing are required to withdraw.

Students with two or more prior requirements to withdraw or equivalents are not eligible to continue in the Faculty of Science and do not have the option to appeal.

(3) **Requirement to Withdraw and Readmission**

Students who are required to withdraw cannot continue or register in subsequent terms beyond Spring. If they wish to continue studies in the Faculty of Science, they must choose one of the following mutually exclusive options:

a. **Fresh Start Program:** is available by recommendation of the Faculty to students whose GPA is between 1. 3 and 1.6 and have taken less than ★60 of postsecondary work. Students who been on probation or have more than one requirement to withdraw or their equivalents, or who have been sanctioned for any academic-related disciplinary offence at this University or elsewhere are not eligible for the Fresh Start program. A minimum of ★18 with a minimum GPA of 2.7 or a minimum of ★24 with a minimum GPA of 2.0 must be successfully completed in the Fresh Start program to be considered for readmission to the Faculty of Science. The Faculty may also specify course requirements to be fulfilled. Students who successfully complete the Fresh Start program may apply for readmission as transfer students (see §16.15.7).

b. **Discontinue Studies and Apply for Fall Readmission:** Students in the Faculty of Science ***who are being required to withdraw for the first time*** in their academic record may elect to discontinue studies for a minimum period of one year and then apply for Fall readmission. Should any coursework be attempted at any institution during this period, the grades may be taken into consideration for readmission purposes, but transfer credit will not be granted.

Students in the Faculty of Science who have failed probation or been twice required to withdraw or equivalent by Faculty of Science standards may discontinue their studies for a period of five years from the date of last attendance and seek consideration for Fall readmission by writing a letter of petition to the Associate Dean, Undergraduate. Readmission, if offered, will be on probation, subject to conditions specified by the Associate Dean, Undergraduate.

Students who have been required to withdraw three times or equivalent are ineligible for readmission to the Faculty of Science.

c. **Requalify:** Students ***who are being required to withdraw for the first time*** in their academic record may elect to requalify by successfully completing at another postsecondary institution:

i. ★18 of postsecondary courses transferable to the University of Alberta with a minimum GPA of 2.7, or

ii. ★24 of postsecondary courses transferable to the University of Alberta with a minimum GPA of 2.0.

(4) **Probation** is granted to students who are required to withdraw and successfully appeal or to students who are readmitted after studies were discontinued for academic reasons. Probation is completed in the BSc General program. When placed on probation, a student must fulfill specific conditions specified by the Associate Dean, Undergraduate at the time of readmission. To clear probation and return to satisfactory standing, students must normally successfully complete a minimum of ★24 during the Fall/Winter, obtain a minimum 2.0 GPA, and successfully fulfill all other conditions of the probation. Students who fail to satisfy any of the conditions fail Probation, and are required to withdraw without the option of appeal. Students who fail a second period on probation are ineligible for readmission to the Faculty of Science

192.5.1 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 and successfully completes a minimum of ★24 during that Fall/Winter. Students who attend only one term of Fall/Winter as a result of enrolment in ABROD, EXCH or WKEXP are eligible if they successfully complete at least ★12 with a minimum GPA of 3.5. This is also referred to as the Dean's Honor Roll.

192.5.2 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.

192.5.3 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 (1-001 CCIS) 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 postsecondary institutions are due by May 1 for Spring Convocation or by October 1 for Fall Convocation.

Students who intend to apply for admission to an alternate degree program in the Faculty of Science for convocation purposes only must meet all of the admission, continuation, residency and graduation criteria for that BSc program.

(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 term then all work from that term is included in the calculation 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 term then all work from that term is included in the calculation 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, academic standing and practicum intervention may be obtained from the Faculty of Science Student Services Office (1-001 CCIS) and on the Faculty of Science website. Certain academic standing decisions made by the Faculty Academic Appeals Committee may be appealed to the General Faculties Council Academic Appeals Committee. Appeals of decisions made by the Faculty Practice Review Committee may be appealed to the General Faculties Council Practice Review Board. See §23.8.

Note: Deadlines exist for submission of appeals and are described in the appeals policy document.

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.

192.11 Science Internship Program

The Science Internship Program (SIP) offers science undergraduate students work experience opportunities in addition to their academic courses.

To be eligible to register in this program a student must:

(1) Have successfully completed a minimum of ★75, and not more than ★105, of a Science General, Honors or Specialization degree program with a declared major.

(2) Be in good standing and have a minimum 2.3 GPA in the previous Fall/Winter Terms.

Students accepted into the program will receive access to approved position descriptions from employers wishing to hire SIP students. Employers 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. Students are limited to one 8, 12 or 16 month internship placement during their undergraduate degree. 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 Faculty must agree to terms of the internship. 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. All students must register in a minimum of two WKEXP courses that have associated fees. Work experience courses are assigned no units of course weight and are graded credit/no credit. Grades are determined by the student's job performance as evaluated by the employer, and/or by the successful completion of assignments as assigned by the Faculty or designate.

The Science Internship Program Coordinator maintains contact at approximately four-month intervals with the student and the person designated by the employer to be responsible for the student's progress. During this time if the student's performance is not satisfactory as evaluated by the employer, the internship may be terminated and the student would then return to classes at the next available opportunity.

Following completion of the work experience students return to the university to complete their degree program of studies. Students must complete the academic requirements of the Science Internship which takes the form of a 400-level SIP course.

Students should be aware that under the *Protection for Persons in Care Act*, students can be required to satisfy a Criminal Record Check before being allowed to start an internship.

Detailed information about the Science Internship Program is available at uab.ca/ScienceInternship.

193 Programs of Study

193.1 BSc 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 §16.15.3 for admission requirements.

Selection of Courses

Note: For success in your chosen program, ensure you have satisfied the pre/corequisite requirements for all courses. Departments have the right to remove students from courses for failing to present a passing grade (or higher, where stipulated) in the prerequisite course(s) and/or for failing to be enrolled in the corequisite course(s). Please see www.science.ualberta.ca/en/ProspectiveStudents/ScienceDegrees.aspx for more information.

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 First Class Honors are awarded as per §192.7(4)a. and b.

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

All BSc Honors programs are designed to be four-year programs. However, in some cases the minimum course load requirements have been reduced to allow students the flexibility to complete the degree over a longer time period. Students wishing to extend their programs beyond the time frame dictated by the minimum course load requirement for their program must first obtain the written approval of the Department and the Associate Dean, Undergraduate or designate.

193.2 BSc 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 §16.15.6 and 75.7).

Admission

See §16.15.4 for admission requirements.

Selection of Courses

Note: For success in your chosen program, ensure you have satisfied the pre/corequisite requirements for all courses. Departments have the right to remove students from courses for failing to present a passing grade (or higher, where stipulated) in the prerequisite course(s) and/or for failing to be enrolled in the corequisite course(s). Please see www.science.ualberta.ca/en/ProspectiveStudents/ScienceDegrees.aspx for more information.

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 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 Completion of Program

All BSc Specialization programs are designed to be four-year programs. However, in some cases the minimum course load requirements have been reduced to allow students the flexibility to complete the degree over a longer time period. Students wishing to extend their programs beyond the time frame dictated by the minimum course load requirement for their program must first obtain the written approval of the Department and the Associate Dean, Undergraduate or designate.

193.3 BSc General Program

Please note that the Faculty of Science is revising the Bachelor of Science in the General Program degree requirements for all students admitted in Fall 2014 and thereafter. Please see www.uofa.ualberta.ca/science/programs/undergraduate for a detailed listing of the approved program requirements.

The BSc General program provides students with a diverse education in more than one branch of study. Students must major in a Science subject area of concentration (as defined either by a single course designator or by groupings of course designators – see below). Students may elect to minor in a Science subject area of concentration, in an Arts subject area of concentration (see §44), in one of a select number of Agricultural, Life and Environmental Sciences subject areas of concentration (see §193.3.1), or in Business (see §193.3.2). In addition to providing a path to the BSc General Degree, this program of study allows for subsequent transfer to Specialization and Honors programs. Students intending to transfer to Honors or Specialization programs should consult the appropriate admission requirements for the program of interest (see §16.15), select carefully their first-year core courses in accordance with the requirements of the specific Honors or Specialization program, and pay close attention to course load and GPA requirements for transfer. Students in the combined BSc/BEd program should consult Education Chart 2 (see §75.4) when choosing courses for their major and minor.

Admission

See §16.15.1 for admission requirements for the BSc (General) programs.

Selection of Courses

Note: For success in your chosen program, ensure you have satisfied the pre/corequisite requirements for all courses. Departments have the right to remove students from courses for failing to present a passing grade (or higher, where stipulated) in the prerequisite course(s) and/or for failing to be enrolled in the corequisite course(s). Please see www.uofa.ualberta.ca/science/programs/undergraduate/admission-to-science for more information.

The following regulations govern the General program:

(1) To obtain a BSc General Degree, a student must receive credit in ★120. At least ★72 and not more than ★102 must be in courses offered by the Faculty of Science. At least ★18 and not more than ★48 must be in courses offered by the Faculty of Arts.

(2) The General program includes a core of courses which must include the following:

a. ★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS

b. ★6 from among junior courses offered by the Departments of Computing Science, and Mathematical and Statistical Sciences (CMPUT 101, 174, 175; MATH 113 or 114 or 117; MATH 115 or 118; MATH 125 or 127; STAT 141 or 151)

c. ★6 from among junior courses in the Departments of Chemistry and Physics (ASTRO 120, 122; CHEM 101, 102, 164; PHYS 114, 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)

(3) Not more than ★42 may be taken at the junior level.

(4) Each student must complete a Science major. See below for specific course requirements in each major subject area of concentration. With the exception of the Physical Science major, which requires ★42, all Science majors require a minimum of ★36 with at least ★12 in 300-level or higher courses taken while registered in the Faculty of Science at the University of Alberta.

(5) Each student must also either:

a. complete a second Science major. Students who complete a second Science major will not have a minor. The Double Majors will be recorded on the student transcript; or

b. complete a minor. With exception of the Physical Sciences minor, which requires ★27, all minors must have at least ★24 with at least ★6 in 300-level or higher courses taken while registered in the Faculty of Science at the University of Alberta. The minor may be in Science (see below), in an Arts subject area of concentration (see §44), in one of a select number of Agricultural, Life and Environmental Sciences subject areas of concentration (see §193.3.1), or in Business (see §193.3.2). For non-Science minors, students are responsible for meeting both

the Faculty of Science minor requirements and any outside Faculty or department-specified course requirements. For information about admission to the Business minor, see §16.15.2.

(6) A maximum of ★18 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 (with the exception of those courses meeting the requirements for a Business minor or one of the allowable minors from Agricultural, Life and Environmental Sciences), nor toward the minimum requirement of ★18 in Arts, nor toward the minimum requirement of ★72 in Science.

Majors

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

Biological Sciences

A major in the Biological Sciences (see Note 1) consists of at least ★36 with at least ★12 at the 300-level or higher. The major must include the following:

(1) BIOL 107, 108, and one of BIOL 207 or 208

(2) At least ★9 in courses at the 200-level or higher with a lab component and offered by the Department of Biological Sciences. The ★3 from BIOL 207 or 208 in Requirement (1) above may not be used to fulfill this program requirement.

(3) At least ★3 from each of the following three areas of study:

a. Ecology, evolution or diversity

b. Genetics and molecular (or micro-) biology

c. Physiology, cell and developmental biology

Consult departmental website for a list of approved courses for each of the three areas of study. BIOL 107, 108, 207 and 208 may not be used to fulfill the program requirements in 3a, 3b or 3c.

(4) At least ★12 at the 300-level or higher, of which at least ★3 must be at the 400-level. Many of the senior Biological Sciences courses require either BIOL 207 or 208 as a prerequisite so both courses are highly recommended.

Chemistry

A major in Chemistry consists of at least ★36 with at least ★12 at the 300-level or higher. The major must include the following:

(1) CHEM 101, 102, 261 (or 164) and 263

(2) At least ★3 from CHEM 211, 241, 282.

(3) At least ★12 in CHEM at the 300-level or higher, of which at least ★3 must be at the 400-level

(4) Any additional courses required to meet the minimum ★36 may come from CHEM or BIOCH.

Although it does not count toward the major, students completing a Chemistry major are recommended to take MATH 113 (or 114) and 115. Some senior CHEM courses require MATH 115 as a prerequisite, so students must plan accordingly.

Computing Science

A major in Computing Science consists of at least ★36 with at least ★12 at the 300-level or higher. The major must include the following:

(1) CMPUT 174 and 175

(2) At least ★6 from CMPUT 201, 204, 229, 272 and 291

(3) At least ★12 in CMPUT at the 300-level or higher, of which at least ★3 must be at the 400-level.

Many of the CMPUT courses have MATH or STAT prerequisites so students must plan accordingly.

Earth and Atmospheric Sciences

A major in Earth and Atmospheric Sciences consists of at least ★36 with at least ★12 at the 300-level or higher. The major must include the following:

(1) EAS 100

(2) At least ★12 at the 300-level or higher, of which at least ★3 must be at the 400-level. Courses may be chosen from Science EAS, GEOPH or PALEO (see Note 4)

Mathematical Sciences

The major in Mathematical Sciences is no longer available. Students admitted to the BSc General program before Fall 2014 and wishing to complete the Mathematical Sciences major have until April 30, 2018 to do so.

Mathematics

A major in Mathematics consists of at least ★36 with at least ★12 at the 300-level or higher. The major must include the following:

(1) MATH 114 (or 113 or 117), 115 (or 118), 214 (or 217) and 215 (or 317)

(2) MATH 125 (or 127) and 225 (or 227)

(3) At least ★3 from MATH 228 and 334

(4) At least ★12 in MATH at the 300-level or higher, of which at least ★3 must be at the 400-level. If taken to meet Requirement (3) above, MATH 334 may be used toward Requirement (4)

Physical Sciences (see Note 7)

A major in Physical Sciences consists of at least ★42 with at least ★12 at the 300-level or higher. The major must include the following:

(1) CHEM 101, 102 and 261 (or 164)

(2) PHYS 124 (or 144), 126 (or 146) and one of PHYS 208 or 271

(3) At least ★3 from CHEM 211, CHEM 241 and PHYS 294

(4) At least ★12 at the 300-level or higher

(5) At least ★12 in each of Chemistry and Physics courses

Chemistry courses may be chosen from BIOCH (see Note 5) or CHEM, and Physics courses may be chosen from ASTRO, GEOPH, MA PH (see Note 6), or PHYS. Many of the courses have MATH pre- or corequisites so students must plan accordingly.

Physics

A major in Physics consists of at least ★36 with at least ★12 at the 300-level or higher. The major must include the following:

(1) PHYS 144 (or 124) and PHYS 146 (or 126); PHYS 144 and 146 are recommended

(2) PHYS 244, 281; PHYS 294 or 295; and PHYS 271 (or PHYS 208 with a grade of B+ or higher)

(3) At least ★3 from PHYS 310, 362, 372, 381 plus an additional ★9 at the 300-level or higher

Courses may be chosen from ASTRO, GEOPH, MA PH or PHYS. Many of the courses have MATH pre- or corequisites so students must plan accordingly and might wish to pair the Physics major with a minor in Mathematics.

Science Psychology

A major in Psychology consists of at least ★36 with at least ★12 at the 300-level or higher. The major must include the following:

(1) PSYCO 104 and 105

(2) At least ★6 chosen from PSYCO 258, 275, 282

(3) At least ★6 chosen from PSYCO 233, 239, 241

(4) At least ★6 in PSYCO at the 300-level or higher (minimum of ★3 from Science and ★3 from Arts).

(5) At least ★6 in PSYCO at the 400-level or higher (minimum of ★3 from Science and ★3 from Arts).

Although it does not count toward the major, students completing a Psychology major must also take STAT 141 or 151. Many senior PSYCO courses require STAT 141 or 151 as a prerequisite so students must plan accordingly.

Statistics

A major in Statistics consists of at least ★36 with at least ★12 at the 300-level or higher. The major must include the following:

(1) STAT 151 and 252

(2) STAT 265 and 266

(3) At least ★12 in STAT at the 300-level or higher, including STAT 312 and STAT 378, and of which at least ★3 must be at the 400-level

The required STAT courses have MATH pre- or corequisites so students must plan accordingly and might wish to pair the Statistics major with a minor in Mathematics.

Notes

(1) Biological Sciences courses include BIOIN (see Note 2), BIOL, BOT, CELL (see Note 3), ENT, GENET, IMIN, MA SC, MICRB, PALEO (see Note 4) and ZOOL courses offered by the Department of Biological Sciences; and BIOCH (see Note 5), MMI (with the exception of 133), NEURO, PHYSL and PMCOL courses offered by the Faculty of Medicine and Dentistry. Students should be aware that 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. For additional Biological Science courses and information see §194.
(2) BIOIN courses are offered jointly by the departments of Biological Sciences and Computing Science and may be counted as Biological Sciences or Computing Science.
(3) CELL courses are offered jointly by the Department of Biological Sciences and the Faculty of Medicine.
(4) PALEO courses are offered jointly by the departments of Biological Sciences and Earth and Atmospheric Sciences and may be counted as Biological Sciences or Earth and Atmospheric Sciences.
(5) BIOCH courses may be counted as Biological Sciences or Physical Sciences or Chemistry.
(6) MA PH courses may be counted as Physical Sciences or Physics.
(7) EAS 323 may be used as a Physical Science or Chemistry course.
(8) Courses in the major and minor may not overlap. For example, the Physical Sciences major or minor may not be paired with a Chemistry or Physics major or minor.

Minors

A Science minor consists of Science courses taken from one of the following subject areas of concentration:

Biological Sciences

A minor in the Biological Sciences (see Note 1) consists of at least ★24 with at least ★6 at the 300-level or higher. The minor must include the following:

(1) BIOL 107, 108, and one of BIOL 207 or 208

(2) At least ★3 from each of the following three areas of study:
   a. Ecology, evolution or diversity
   b. Genetics and molecular (or micro-) biology
   c. Physiology, cell and developmental biology

Consult departmental website for a list of approved courses for each of the three areas of study. BIOL 107, 108, 207 and 208 may not be used to fulfill the program requirements in 2a, 2b or 2c.

(3) At least ★6 at the 300-level or higher

Many of the senior Biological Sciences courses require either BIOL 207 or 208 as a prerequisite so both courses are highly recommended.

Chemistry

A minor in Chemistry consists of at least ★24 with at least ★6 at the 300-level or higher. The minor must include the following:

(1) CHEM 101, 102, 261 (or 164) and 263.

(2) At least ★3 from CHEM 211, 241, 282.

(3) At least ★6 in CHEM at the 300-level or higher.

(4) Any additional courses required to meet the minimum ★24 may come from CHEM or BIOCH.

Computing Science

A minor in Computing Science consists of at least ★24 with at least ★6 at the 300-level or higher. The minor must include the following:

(1) CMPUT 174 and 175

(2) At least ★6 from CMPUT 201, 204, 229, 272 and 291

(3) At least ★6 in CMPUT at the 300-level or higher.

Many of the CMPUT courses have MATH or STAT prerequisites so students must plan accordingly

Earth and Atmospheric Sciences

A minor in Earth and Atmospheric Sciences consists of at least ★24 with at least ★6 at the 300-level or higher. The minor must include the following:

(1) EAS 100

(2) At least ★12 at the 300-level or higher.

Courses may be chosen from Science EAS, GEOPH or PALEO (see Note 4).

Mathematical Sciences

The minor in Mathematical Sciences is no longer available. Students admitted to the BSc General program before Fall 2014 and wishing to complete the Mathematical Sciences minor have until April 30, 2018 to do so.

Mathematics

A minor in Mathematics consists of at least ★24 with at least ★6 at the 300-level or higher. The minor must include the following:

(1) MATH 114 (or 113 or 117), 115 (or 118), 214 (or 217)

(2) MATH 125 (or 127) and 225 (or 227)

(3) MATH 228, or both MATH 215 (or 317) and MATH 334

(4) At least ★6 in MATH at the 300-level or higher. Any 300-level courses taken to meet Requirement (3) above may be used toward Requirement (4).

Physical Sciences (see Note 7)

A minor in Physical Sciences consists of at least ★27 with at least ★6 at the 300-level or higher. The minor must include the following:

(1) CHEM 101, 102 and 261(or 164)

(2) PHYS 124 (or 144), 126 (or 146)

(3) At least ★9 in each of Chemistry and Physics courses

(4) At least ★6 at 300-level or higher

Courses may be chosen from ASTRO, BIOCH (see Note 5), CHEM, GEOPH, MA PH (see Note 6), or PHYS.

Physics

A minor in Physics consists of at least ★24 with at least ★6 at the 300-level or higher. The minor must include the following:

(1) PHYS 144 (or 124) and PHYS 146 (or 126); PHYS 144 and 146 are recommended

(2) PHYS 244, 281; PHYS 294 or 295; and PHYS 271 (or PHYS 208 with a grade of B+ or higher)

(3) At least ★3 from PHYS 310, 362, 372, 381 plus an additional ★3 at the 300-level or higher

Courses may be chosen from ASTRO, GEOPH, MA PH or PHYS. Many of the courses have MATH pre- or corequisites so students must plan accordingly and might wish to pair the Physics minor with a major in Mathematics.

Psychology

A minor in Psychology consists of at least ★24 with at least ★6 at the 300-level or higher. The minor must include the following:

(1) PSYCO 104 and 105

(2) At least ★3 chosen from PSYCO 258, 275, 282

(3) At least ★3 chosen from PSYCO 233, 239, 241

(4) At least ★6 in PSYCO at the 300-level or higher (minimum of ★3 from Science and ★3 from Arts)

Although it does not count toward the minor, students completing a Psychology minor must also take STAT 141 or 151. Many senior PSYCO courses require STAT 141 or 151 as a prerequisite so students must plan accordingly.

Statistics

A minor in Statistics consists of at least ★24 with at least ★6 at the 300-level or higher. The minor must include the following:

(1) STAT 151 and 252

(2) STAT 265 and 266

(3) STAT 312 and 378

The required STAT courses have MATH pre- or corequisites so students must plan accordingly and might wish to pair the Statistics minor with a major in Mathematics

Non-Science Minors

Science students may also complete a minor outside of the Faculty of Science. For information about the BSc General – minor in Arts, see §44 (all Arts minors are available to Science students with the exception of Arts and Cultural Management). For information about the BSc General – minor in Agricultural, Life and Environmental Sciences, see §193.3.1. For information about the BSc General – minor in Business, see §193.3.2. In all cases, the faculty and/or department-specified requirements for the minor must be met.

Notes

(1) Biological Sciences courses include BIOIN (see Note 2), BIOL, BOT, CELL (see Note 3), ENT, GENET, IMIN, MA SC, MICRB, PALEO (see Note 4) and ZOOL courses offered by the Department of Biological Sciences; and BIOCH (see Note 5), MMI (with the exception of 133), NEURO, PHYSL and PMCOL courses offered by the Faculty of Medicine and Dentistry. Students should be aware that 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. For additional Biological Science courses and information see §194.
(2) BIOIN courses are offered jointly by the departments of Biological Sciences and Computing Science and may be counted as Biological Sciences or Computing Science.
(3) CELL courses are offered jointly by the Department of Biological Sciences and the Faculty of Medicine.

(4) PALEO courses are offered jointly by the departments of Biological Sciences and Earth and Atmospheric Sciences and may be counted as Biological Sciences or Earth and Atmospheric Sciences.
(5) BIOCH courses may be counted as Biological Sciences or Physical Sciences or Chemistry.
(6) MA PH courses may be counted as Physical Sciences or Physics.
(7) EAS 323 may be used as a Physical Science or Chemistry course.
(8) Courses in the major and minor may not overlap. For example, the Physical Sciences major or minor may not be paired with a Chemistry or Physics major or minor.

Course Load Requirements

Students in the General program should normally take ★30 during the Fall/Winter of each year of the program if they wish to complete the program in four years. Although not held to a minimum Fall/Winter course load requirement while registered in the General program, students intending to transfer to an Honors or Specialization program should pay close attention to course load and GPA requirements for transfer to their program of interest.

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. Students wishing to extend their programs beyond four years must first obtain approval of the Senior Associate Dean of Science or designate.

193.3.1 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 §193.3 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) REN R 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 REN R 307, 360, 364, 376, 441, 442, 443, 444, 445, 446, 462, 464, 465, 467, 474, 476, 482, and 483, can also be chosen as options.

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) ★21 to ★27 in HECOL courses, with at least ★9 at the 300-level or higher.

Minor in Nutrition

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

(1) NUTR 100
(2) NU FS 305, 356, 373
(3) ★12 to ★18 from the following: NUTR 480, NU FS 200, 223, 363, 374, 377, 427, 428

Note: CHEM 261 and 263 are prerequisites for NU FS 373.

193.3.2 BSc General—Minor in Business

Note: For requirements, see §193.3. 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, OM 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.

193.4 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 a 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 BSc (Specialization in Science and Education)/BEd (Secondary) 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.

Admission

Students apply to the Faculty of Science for admission to the BSc (Specialization in Science and Education)/BEd (Secondary) program and normally spend the first two years of the five-year combined degrees program registered in the Faculty of Science. (See §16.15.6)

Selection of Courses

Note: For success in your chosen program, ensure you have satisfied the pre/corequisite requirements for all courses. Departments have the right to remove students from courses for failing to present a passing grade (or higher, where stipulated) in the prerequisite course(s) and/or for failing to be enrolled in the corequisite course(s). Please see www.uofa.ualberta.ca/science/programs/undergraduate/admission-to-science for more information.

The following regulations govern the BSc (Specialization in Science and Education)/BEd (Secondary) 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, ★48 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 (Specialization in Science and Education)/BEd (Secondary) program 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 (Specialization in Science and Education)/BEd (Secondary) program at the University of Alberta.
(5) No more than ★42 at the 100-level are permitted in the BSc (Specialization in Science and Education)/BEd (Secondary) program.

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 the BSc (Specialization in Science and Education)/BEd (Secondary) 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 combined degrees 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 degrees program requires a GPA of 2.7 in the declared major.

(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 promoted 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 further Fall/Winter to achieve the required standing and requires the written approval of the Dean of Science and the Dean of Education.

(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 a BSc program in the Faculty of Science or the BEd program in the Faculty of Education, provided they meet the necessary admission GPA.

(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 a BSc program must be made after Year 2 at the latest to avoid loss of credit.

(7) The BSc (Specialization in Science and Education) degree With Distinction is 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 degrees 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 normally permitted and requires the written approval of the Dean of Science and the Dean of Education.

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.

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: ★48 Major: ★45 Minor: ★27 100-level: ★30 (Maximum ★42) **Graduation Requirements:** GPA of 2.3 on **all** courses GPA of 2.7 on **Major** courses **Area "B"** ANTHR 230, BIOL 315, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375, STS 200, SOC 462, W ST 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 ENGL or WRS 4. MATH 113 or 114 5. ★3 chosen from MATH 115, 125 or STAT 141 or 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. EDU 250 or ★3 Education option 4. EDPY 200 5. ★3 chosen from MATH 115 or 125 or STAT 141 or 151 6. ★6 in Biological Sciences at the 200-level 7. ★6 in Mathematical Sciences at the 200-level	1. ★3 chosen from MATH 115 or 120 or STAT 141 or 151 2. ★6 in Biological Sciences at the 200-level 3. ★6 Area "B" 4. ★6 Arts options 5. ★3 Mathematical Sciences at the 300- or 400-level 6. ★3 Education option 7. ★CMPUT 101 or 174	1. EDFX 350 (5 weeks) 2. EDPS 310 3. EDSE 352 (Major) 4. EDSE 307 5. EDPY 303 6. ★6 in Biological Sciences at the 200-, 300- or 400-level 7. ★3 EDSE 338 (Minor) 8. ★3 EDPY 301 9. ★EDPS 410 **Note:** Courses 1 through 5 above constitute these Introductory Professional Term and must be taken concurrently.	1. EDFX 450 (9 weeks) 2. EDSE 451 3. EDSE 452 (Major) 4. ★12 in Biological Sciences at the 300- or 400-level 5. ★3 in Mathematical Sciences at the 300- or 400-level **Note:** Courses 1 through 3 above constitute the Advanced Professional Term and must be taken concurrently

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 ★48 Major: ★42 Minor: ★27 100-level: ★33 (Maximum ★42) **Graduation Requirements:** GPA of 2.3 on **all** courses GPA of 2.7 on **Major** courses **Area "A"** CHEM 211, 263, PHYS 208, 271 **Area "B"** ANTHR 230, BIOL 315, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375 STS 200, SOC 462, W ST 350 **Area "C"** ASTRO 320, 322, PHYS 301, 308, 310, 311, 362, 364 or any 300-level CHEM. **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 ENGL or WRS 4. MATH 113 or 114 5. MATH 115 6. PHYS 124 or 144 7. PHYS 126 or 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. ★3 Area "A" 7. ★3 in Biological Sciences at the 200-level 8. ★6 Arts options	1. CMPUT 101 or 174 2. ★6 in Biological Sciences at the 200-level 3. PHYS 261 4. ★6 Area "B" 5. ★3 in Education options 6. ★6 in Arts options 7. ★3 Area "C"	1. EDFX 350 (5 weeks) 2. EDPS 310 3. EDSE 352 (Major) 4. EDSE 307 5. EDPY 303 6. ★6 in Biological Sciences at the 200-, 300- or 400-level 7. EDSE 305 (Minor) 8. EDPS 410 9. EDPY 301 **Note:** Courses 1 through 5 above constitute the Introductory Professional Term and must be taken concurrently.	1. EDFX 450 (9 weeks) 2. EDSE 451 3. EDSE 452 (Major) 4. ★12 in Biological Sciences at the 300- or 400-level 5. ★3 Area "C" **Note:** Courses 1 through 3 above constitute the Advanced Professional Term and must be taken concurrently.

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

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.

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: ★48 Major: ★45 Minor: ★27 100-level: ★33 (Maximum ★42) **Graduation Requirements:** GPA of 2.3 on **all** courses GPA of 2.7 on **Major** courses **Area "B"** ANTHR 230, BIOL 315, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375, PHYS 261, SOC 462, STS 200, W ST 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 ENGL or WRS 3. MATH 113 or 114 4. MATH 115 5. MATH 125 6. STAT 141 or 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. ★3 CMPUT 101 or 174 2. ★3 in Biological Sciences at the 200-level 3. ★6 in Mathematical Sciences at the 200- or 300- or 400-level 4. ★6 in Biological Sciences at the 200- or 300- or 400-level 5. ★6 Arts options 6. ★6 Area "B"	1. EDFX 350 (5 weeks) 2. EDPS 310 3. EDSE 337 (Major) 4. EDSE 307 5. EDPY 303 6. ★6 in Biological Sciences at the 300- or 400-level 7. ★3 in Mathematical Sciences at the 300- or 400-level 8. EDSE 353 (Minor) 9. EDPS 410 **Note:** Courses 1 through 5 above constitute the Introductory Professional Term and must be taken concurrently.	1. EDFX 450 (9 weeks) 2. EDSE 451 3. EDSE 437 (Major) 4. ★9 in Mathematical Sciences at the 300- or 400- level 5. ★3 Education options 6. EDPY 301 **Note:** Courses 1 through 3 above constitute the Advanced Professional Term and must be taken concurrently

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: ★48 Major: ★45 Minor: ★30 100-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 **Area "B"** ANTHR 230, BIOL 315, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375, PHYS 261, STS 200, SOC 462, W ST 350 **Area "C"** ASTRO 320, 322, PHYS 301, 308, 310, 311, 362, 364 or any 300-level CHEM **Note:** It is the student's responsibility to ensure all prerequisites for 300-level courses are met.	1. BIOL 107, 108 2. ★6 junior ENGL or WRS 3. MATH 113 or 114 4. MATH 115 5. MATH 125 6. STAT 141 or 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 option	1. CMPUT 101 or 174 2. ★3 Area "A" 3. PHYS 208 or 271 4. ★3 in Mathematical Sciences at the 200-level 5. ★3 in Mathematical Sciences at the 200, 300 or 400-level 6. ★6 in Arts Options 7. ★3 in Education Option 8. ★6 Area "B"	1. EDFX 350 (5 weeks) 2. EDPS 310 3. EDSE 337 (Major) 4. EDSE 307 5. EDPY 303 6. ★3 in Mathematical Sciences at the 300- or 400-level 7. EDSE 366 (Minor) 8. ★6 Area "C" 9. EDPS 410 **Note:** Courses 1 through 5 above constitute the Introductory Professional Term and must be taken concurrently.	1. EDFX 450 (9 weeks) 2. EDSE 451 3. EDSE 437 (Major) 4. ★9 in Mathematical Sciences at the 300- or 400- level 5. EDPY 301 6. ★3 Area "A" **Note:** Courses 1 through 3 above constitute the Advanced Professional Term and must be taken concurrently.

Physical Sciences Major/Biological Sciences Minor

Chemistry Concentration (★150)

Core Program Requirements	Year 1 (★30)	Year 2 (★30)	Year 3 (★30)	Year 4 (★30)	Year 5 (★30)
Education: ★48 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"** ANTHR 230, BIOL 315, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375, PHYS 261, SOC 462, STS 200, W ST 350 **Area "C"** ASTRO 320, 322, PHYS 301, 308, 310, 311, 362, 364 or any 300-level CHEM. **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 ENGL or WRS 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 or 174 4. EDU 250 or ★3 Education Option 5. EDPY 200 6. PHYS 208 or 271 7. ★3 chosen from CHEM 211 or PHYS 294 8. ★6 Arts options	1. CHEM 263 2. ★3 chosen from CHEM 211 or PHYS 294 3. ★6 in Biological Sciences at the 200-level 4. ★3 Arts option 5. ★6 Area "B" 6. ★3 Area "C" 7. PHYS 281 8. ★3 Science option	1. EDFX 350 (5 weeks) 2. EDPS 310 3. EDSE 307 4. EDSE 364 (Major) 5. EDPY 303 6. EDPS 410 7. EDSE 305 (Minor) 8. ★6 in Biological Sciences at the 300- or 400-level 9. ★3 Arts option **Note:** Courses 1 through 5 above constitute the Introductory Professional Term and must be taken concurrently.	1. EDFX 450 (9 weeks) 2. EDSE 451 3. EDSE 460 (Major) 4. ★3 Education options 5. ★9 Area "C" 6. EDPY 301 **Note:** Courses 1 through 3 above constitute the Advanced Professional Term and must be taken concurrently.

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

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

Physics Concentration (★150)

Core Program Requirements	Year 1 (★30)	Year 2 (★30)	Year 3 (★30)	Year 4 (★30)	Year 5 (★30)
Education: ★48 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"** ANTHR 230, BIOL 315, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375, PHYS 261, SOC 462, STS 200, W ST 350 **Area "C"** ASTRO 320, 322, PHYS 301, PHYS 308, 310, 311, PHYS 362, 364 or any 300-level CHEM. **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 ENGL or WRS 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 or 174 4. EDU 250 or ★3 Education option 5. EDPY 200 6. PHYS 208 or 271 7. MATH 214 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 3. ★6 in Biological Sciences at the 200-level 4. PHYS 281 5. MATH 215 6. ★6 Arts options 7. ★3 Area "B" 8. ★3 Area "C"	1. EDFX 350 (5 weeks) 2. EDPS 310 3. EDSE 307 4. EDPY 303 5. EDSE 364 (Major) 6. EDPS 410 7. EDSE 305 (Minor) 8. ★6 in Biological Sciences at the 300- or 400-level 9. ★3 Arts option **Note:** Courses 1 through 5 above constitute the Introductory Professional Term and must be taken concurrently.	1. EDFX 450 (9 weeks) 2. EDSE 451 3. EDSE 460 (Major) 4. ★3 Education options 5. ★9 Area "C" 6. EDPY 301 **Note:** Courses 1 through 3 above constitute the Advanced Professional Term and must be taken concurrently.

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: ★48 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"** ANTHR 230, BIOL 315, CHRTC 350, 352, CLASS 294, HIST 294, 391, 394, 396, 397, 398, 496, PHIL 217, 265, 317, 375, SOC 462, STS 200, W ST 350 **Area "C"** ASTRO 320, 322, PHYS 301, 308, 310, 311, 362, 364 or any 300-level CHEM. **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 ENGL or WRS 4. MATH 113 or 114 5. MATH 115 6. PHYS 124 or 144 7. PHYS 126 or 146	1. CMPUT 101 or 174 2. CHEM 261 3. EDU 250 or ★3 Education Option 4. EDPY 200 5. MATH 125 6. MATH 214 7. PHYS 261 or 281 8. PHYS 208 or 271 9. ★3 chosen from CHEM 211 or PHYS 294 10. ★3 Arts option	1. CHEM 263 2. MATH 228 3. MATH 215 4. ★3 chosen from CHEM 211 or PHYS 294 5. ★6 Arts options 6. ★6 Area "B" 7. ★6 Area "C"	1. EDFX 350 (5 weeks) 2. EDPS 310 3. EDSE 307 4. EDPY 303 5. EDSE 364 (Major) 6. EDSP 410 7. EDSE 338 (Minor) 8. ★6 in Mathematical Sciences at the 300- or 400-level 9. ★3 Science options **Note:** Courses 1 through 5 above constitute the Introductory Professional Term and must be taken concurrently.	1. EDFX 450 (9 weeks) 2. EDSE 451 3. EDSE 460 (Major) 4. ★3 Arts option 5. ★3 Education options 6. ★6 Area "C" 7. EDPY 301 **Note:** Courses 1 through 3 above constitute the Advanced Professional Term and must be taken concurrently.

193.5 After Degrees

An individual holding one or more undergraduate degrees from recognized postsecondary institutions may earn an additional undergraduate degree (After Degree) from the Faculty of Science. The After Degree may be a BSc General, a BSc Specialization or a BSc Honors degree. The BSc Specialization in Science and Education degree is not available as an After Degree. There may be a limit on the number of After Degree students admitted each year because the Faculty of Science is under enrolment management. Admission priority will be given to students applying for their first after degree from the Faculty of Science.

Note: For success in your chosen program, ensure you have satisfied the pre/corequisite requirements for all courses. Departments have the right to remove students from courses for failing to present a passing grade (or higher, where stipulated) in the prerequisite course(s) and/or for failing to be enrolled in the corequisite course(s). Please see www.uofa.ualberta.ca/science/programs/undergraduate/admission-to-science for more information.

(1) All of the admission, program, academic standing and graduation standards that apply to a regular degree also apply to After Degree programs, except as noted in §192.5.2. Admission to a BSc Specialization or BSc Honors After Degree program requires the approval of the appropriate Department and the Faculty office. Please refer to section §16.15 for program admission requirements in the Faculty of Science.

(2) An After Degree may not duplicate the degree(s) previously completed. The major or minor of a BSc General After Degree may not be the same as the major or minor of the previous degree(s). The only exception is that students who wish to upgrade a previous Science minor to be the major in the After Degree may do so provided their new minor does not overlap with either the major or minor of the previous degree(s). In the case of BSc Specialization and BSc Honors programs, the area of concentration may not be the same as that of the previous degree(s). However, qualified students holding a BSc General degree from this institution or its equivalent from another institution may use the After Degree to upgrade their previous major to a BSc Specialization or BSc Honors program.

(3) If applying to a BSc General After Degree program, a major and a minor must be declared upon application.

(4) All students in After Degree programs must follow the program to which they have been admitted and must demonstrate progress towards completion of the degree in each Fall/Winter (see §192.5.2).

(5) To complete an After Degree, a minimum ★30 will be required if the student holds a BSc degree from the Faculty of Science at the University of Alberta, and a minimum of ★60 will be required if the student holds an undergraduate degree from another Faculty or University. The actual number of credits required to complete an After Degree is dependent on the coursework that was completed prior to the After Degree program and will be determined at the time of admission.

(6) In a BSc General After Degree program, students with a previous BSc General degree from the Faculty of Science at the University of Alberta must complete a minimum of ★9 senior units in their major and a minimum of ★6 senior units in their minor while registered in the After Degree program. Students holding a degree from outside the Faculty of Science at the University of Alberta must complete a minimum of ★18 senior units in their

major and a minimum of ★12 senior units in their minor while registered in the After Degree program.

(7) In a BSc Specialization or BSc Honors After Degree program, students with a previous undergraduate degree from the Faculty of Science at the University of Alberta must complete a minimum of ★15 senior units in the area of concentration of the new degree while registered in the After Degree program. Students holding a degree from outside the Faculty of Science at the University of Alberta must complete a minimum of ★24 in the area of concentration of the new degree while registered in the After Degree program.

194 Programs by Department

194.1 Biochemistry

194.1.1 Honors in Biochemistry

Continuation in the Honors in Biochemistry program requires successful completion of ★30 with a minimum 3.3 GPA in the previous Fall/Winter. In addition, graduation requires a minimum grade of B- or higher on a minimum of ★39 BIOCH courses credited towards the degree.

Year 1

BIOL 107
CHEM 101, 102 and 261 (or 164)
MATH 113 or 114; ★3 junior-level MATH or STAT option
PHYS 124 and 126 (or equivalent)
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS

Year 2

BIOCH 200 (Fall), and BIOCH 320, 330 (Winter)
BIOL 201
CHEM 211, 213
CHEM 263 (Fall)
★6 in approved options
★3 in an approved Arts option

Year 3

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

Year 4

★9 in senior-level BIOCH courses
BIOCH 499
★6 in Group A or Group B options
★6 in approved 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 for advice about course selection throughout the program. Several alternative course schedules are possible.
(3) Group A options are selected from BIOCH 4XX, CHEM, PHYS, MATH, STAT, CMPUT. Group B options are selected from Group A or BIOIN, CELL, GENET, IMIN, MICRB, PHYSL, PMCOL. Group A and B options may not be junior courses.
(4) Credit in SCI 100 will be considered equivalent to BIOL 107, CHEM 101, 102, 164, MATH 114, PHYS 124, 126, ★3 junior-level MATH or STAT option and ★3 Science option.

194.1.2 Specialization in Biochemistry

Continuation in the Specialization in Biochemistry program requires successful completion of at least ★24 with a minimum 2.7 GPA in the previous Fall/Winter. In addition, graduation requires a minimum grade of B- in BIOCH 200, 310, 320 and 330 and a minimum grade of C in all other BIOCH courses credited towards the degree.

Year 1

BIOL 107
CHEM 101, 102 and 261 (or 164)
MATH 113 or 114; ★3 junior-level MATH or STAT option
PHYS 124 and 126 (or equivalent)
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS

Year 2

BIOCH 200 (Fall), and BIOCH 320, 330 (Winter)
BIOL 201
CHEM 211, 213
CHEM 263 (Fall)
★6 in approved options
★3 in an approved Arts option

Year 3

BIOCH 310 (Fall), and BIOCH 401
★6 in senior-level BIOCH courses
★3 in Group A options
★6 in approved Science options
★6 in approved Arts options

Year 4

★6 in senior-level BIOCH courses
★6 in approved Science options
★3 in an approved Arts option
★12 in approved options
★3 in Group B 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 for advice about course selection throughout the program. Several alternative course schedules are possible.
(3) Group A options are selected from BIOCH 4XX, CHEM, CMPUT, MATH, PHYS, STAT. Group B options are selected from Group A or BIOIN, CELL, GENET, IMIN, MICRB, PHYSL, PMCOL. Group A and B options may not be junior courses.
(4) Students in the specialization program are strongly encouraged to take BIOCH 498 or 499 as a fourth year Science option.
(5) Credit in SCI 100 will be considered equivalent to BIOL 107, CHEM 101, 102, 164, MATH 114, PHYS 124, 126, ★3 junior-level MATH or STAT option and ★3 Science option.

194.2 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 §194.2.4. 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.

194.2.1 Honors in Biological Sciences (including Bioinformatics)

Admission to the BSc Honors in Biological Sciences program see Admission Chart 7, §16.15.

Continuation in the Honors in Biological Sciences program requires successful completion of at least ★24 with a minimum 3.0 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA on the last ★60 credited to the degree.

194.2.2 Specialization in Biological Sciences

Admission to the BSc Specialization in Biological Sciences program see Admission Chart 7, §16.15.

Continuation in the Specialization in Biological Sciences program requires successful completion of at least ★24 with a minimum 2.3 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA on all courses credited to the degree.

194.2.3 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 125; STAT 151; ★6 in Arts options (junior level ENGL or WRS recommended); ★6 in program-specific courses (see individual programs for requirements and recommendations). SCI 100 may be used in lieu of BIOL 107, 108, CHEM 101, 164 and MATH 114.

194.2.4 Course Sequence in Biological Sciences

See Science Chart 2.

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 125; STAT 151 ★6 Arts options (junior level ENGL or junior WRS 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; BIOL 380 or GENET 270; ENT 220 or ZOOL 250 or 352; ZOOL 303; ZOOL 325; ZOOL 370 or 371 ★9 Arts options ★15 from List A ★3 from List B (discussion courses) ★12 approved options (including additional courses from List A or B) List A: BIOL 330, 331, 332, 335, 341, 361, 367. 380, 391, 392, 398, 399, 400, 430, 490, 495, 498, 499; EAS 230; ENT 207, 220, 321, 378, 380, 392, 427; GENET 270; MA SC 410, 412, 430, 440; PALEO 201, 418, 419; ZOOL 241, 242, 250, 303, 340, 342, 343, 351, 352, 354, 370, 371, 405, 406, 407, 408, 450, 452. List B: BIOL 433, 434, 445, 468, 495 (if appropriate topic); ENT 401; GENET 422; MA SC 480; ZOOL 402, 441, 442, 450, 452, 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. (3) Credit in SCI 100 will be considered equivalent to BIOL 107, 108; CHEM 101, 261; MATH 114; ★6 Science options and ★6 Approved options.

Bioinformatics

Year 1	Year 2	Year 3 and 4
BIOL 107, 108; CHEM 101, 102, 164 or 261; ★6 Arts options (junior level ENGL or junior WRS recommended) 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 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 301, 302, 304, 305, 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, 398, 399, 400, 421, 490, 495, 498, 499; CMPUT 229, 304, 325, 340, 366, 379, 391, 466, 474, 495; GENET 301, 302, 304, 305, 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. (3) Credit in SCI 100 will be considered equivalent to BIOL 107, 108; CHEM 101, 102, 261; CMPUT 174; MATH 114 and ★6 Science options.

Ecology

Year 1	Year 2	Year 3 and 4
BIOL 107, 108; CHEM 101, 164 or 261; MATH 113 or 114 or 125; STAT 151 ★6 Arts options (junior level ENGL or junior WRS recommended) ★6 Science options (EAS 100 recommended)	BIOCH 200; BIOL 207, 208; BOT 205; MICRB 265; ZOOL 224 or 325 or PALEO 201; 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 321; GENET 270, 305; IMIN 200; MICRB 311; ZOOL 241, 242, 303 ★6 from BIOL 322, BOT 314, 321, 322, 330; ENT 427; ZOOL 351, 352, 405, 406, 407, 408 ★9 from BIOL 333, 361, 364, 366, 367, 381, 384, 398, 399, 430, 433, 434, 464, 468, 471, 490, 498, 499; 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. (3) Credit in SCI 100 will be considered equivalent to BIOL 107, 108; CHEM 101, 164; EAS 100; MATH 114; ★3 Science options and ★6 Approved options.

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 125; STAT 151 ★6 Arts options (junior level ENGL or junior WRS recommended) ★6 Science options	BIOCH 200; BIOL 207, 208, 321 ★6 from BOT 205, 210; ENT 207, 220, 380; MICRB 265; PALEO 201; 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 400, 414, 418, 419 ★3 from BIOL 331, 332; BOT 332 ★3 from GENET 270, 390 ★6 from BIOL 322; BOT 314, 321; ENT 427; ZOOL 325, 405, 406, 407, 408, 450 ★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 398, 399, 400, 421, 430, 433, 490, 495, 498, 499; BOT 303, 308, 322, 330, 350, 506, 511; EAS 100, 105, 230; GENET 270, 305; MA SC 410, 412, 420, 430, 440, 445; 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. (3) Credit in SCI 100 will be considered equivalent to BIOL 107, 108; CHEM 101, 261; MATH 114; ★6 Science options and ★6 Approved options

Microbiology

Year 1	Year 2	Year 3 and 4
BIOL 107, 108; CHEM 101, 102, 164 or 261; MATH 113 or 114 or 125; STAT 151 ★6 Arts options (junior level ENGL or junior WRS 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; GENET 390; MICRB 311, 316 ★6 in Arts options ★12 in Microbiology options (List A) ★15 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: BIOL 322; IMIN 324, 371, 372, 452; MICRB 315, 320, 343, 345, 410, 423, 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 398, 399, 400, 490, 495, 498, 499; CHEM 211, 213, 303, 361, 363, 371, 373; CMPUT 101, 174, 175; ENT 378; GENET 301, 302, 304, 305, 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; REN R 210, 442. **Notes** (1) Honors students are required to take BIOL 499, MICRB 343 and 345 and reduce the number of Science and Microbiology options each by ★6. (2) Credit in SCI 100 will be considered equivalent to BIOL 107, 108; CHEM 101, 102, 261; CMPUT 174; MATH 114; PHYS 144 and 146. (3) CHEM 211 and 213 are highly reccomended.

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 125; STAT 151 ★6 Arts options (junior level ENGL or junior WRS 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; MICRB 265 ★6 Arts options ★6 Science options **Note:** GENET 270 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) Students required to take at least ★6 from GENET 301, 302, 304 and ★6 from BIOL 380, GENET 305, 390. ★9 from List A ★3 from List B ★15 from List C ★6 in Arts options ★12 in approved options List A: GENET 364, 408, 412, 418 and either GENET 422 or 424. List B: BIOL 391; GENET 375, 420. List C: Including, but not restricted to the following: ANAT 400; BIOCH 310, 320, 330, 401, 410, 420, 430, 450; BIOL 315, 321, 391, 398, 399, 400, 490, 495, 498, 499; BOT 303, 382, 445, 464; CELL 300, 301, 402, 415, 445; CHEM 371, 373; ENT 321; GENET 301, 302, 304, 305, 364, 375, 390, 398, 399, 408, 412, 418, 420, 422, 424; IMIN 200, 324, 371, 401; MICRB 311, 316, 320, 343, 345, 415, 470, 492; ONCOL 320, 425; 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) Credit in SCI 100 will be considered equivalent to BIOL 107, 108; CHEM 101, 102, 261; MATH 114, ★3 Science options and ★6 Approved options.

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 125; STAT 151 ★6 Arts options (junior level ENGL or junior WRS 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, 450 or BIOL 445 ★3 from BIOCH 310, 320, 330 or CELL 300 ★9 from ZOOL 340, 342, 343, 352 or BIOL 341 or 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 341, 391, 398, 399, 400, 490, 495, 498, 499, 545; BOT 303, 340, 403, 445; CELL 300, 301, 402, 415; ENT 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, 450, 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. (4) Credit in SCI 100 will be considered equivalent to BIOL 107, 108; CHEM 101, 261; MATH 114, ★6 Science options and ★6 Approved options.

Plant Biology

Year 1	Year 2	Year 3 and 4
BIOL 107, 108; CHEM 101, 164 or 261; MATH 113 or 114 or 125; STAT 151 ★6 Arts options (junior level ENGL or junior WRS recommended) ★6 Science options	BIOCH 200; BIOL 201, 207, 208, 321; BOT 205; CHEM 102 ★3 Arts option ★6 approved options	BOT 308, 321, 332, 340; MICRB 265 ★3 from GENET 270, 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, 398, 399, 400, 430, 433, 470, 490, 495, 498, 499; BOT 303, 314, 322, 330, 340, 380, 382, 403, 445, 464, 506, 511, 545; FOR 372; GENET 364; PL SC 335, 355, 380, 385, 465; REN R 421, 468. **Notes** (1) 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, 445, 506, 511, 545; or BIOL 495 (if appropriate topic). (2) Credit in SCI 100 will be considered equivalent to BIOL 107, 108; CHEM 101, 102, 261; MATH 114; ★6 Science options and ★3 Approved options.

194.2.5 Science Internship Program

A Science Internship Program, is offered to students in the General, Specialization or Honors programs in Biological Sciences (see §192.11 for guidelines to the program). The Science Internship designation will appear on the degree parchments of students who have participated in the program and who have also successfully completed BIOL 400.

194.2.6 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 BIOCH; BIOIN; BIOL; BOT; CELL; ENT; GENET; IMIN; MA SC; MICRB; MMI (with the exception of MMI 133); NEURO; NU FS 363; PMCOL (with the exception of PMCOL 300); PALEO; PHYSL (with the exception of PHYSL 600) and ZOOL.

Courses in Biochemistry 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: 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.

194.3 Cell Biology

194.3.1 Honors in Cell Biology

Continuation in the Honors in Cell Biology program requires successful completion of at least ★24 with a minimum 3.0 GPA in each preceding Fall/Winter. In addition, graduation requires a minimum 3.0 GPA on all courses credited towards the degree.

Year 1

BIOL 107
CHEM 101, 102
CHEM 164 or 261
MATH 113 or 114
PHYS 124, 126
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS
★3 in approved options

Year 2

BIOCH 200
BIOL 207
CELL 201 or BIOL 201
CHEM 263
GENET 270
MICRB 265
STAT 141 or 151
★3 in an Arts option
★6 in approved options

Year 3

BIOCH 320 or CHEM 371
CELL 300, 301
★6 from Group A Cell Biology options (BIOCH 401 recommended)
★9 in approved options
★6 in Arts options

Notes

(1) Cell Biology students should take BIOCH 320 in Winter Term of Year 2 if selecting BIOCH 401 option; BIOCH 330 is not required for Cell Biology students.
(2) CHEM 371 requires MATH 115 to be taken as an approved option in Year 2

Year 4

CELL 499
★3 from a 400-level CELL course
★6 from Group A Cell Biology options
★12 in approved options
★3 in an Arts option

Notes

(1) Students are required to consult the Department of Cell Biology for selection and approval of all options.
(2) Students are encouraged to select approved options from the Cell Biology Group A or recommended options list, but may also follow a course of study tailored to their interests (must be approved by a Cell Biology advisor).
(3) Credit in SCI 100 will be considered equivalent to BIOL 107, 108, CHEM 101, 102, 164, MATH 114, 115, PHYS 124, 126.

Cell Biology Group A Options

BIOCH 401, 420, 425, 441, 450, 481, 482
BIOCH 430 or GENET 304
BIOL 421
CELL 310, 398, 402, 405, 410, 415, 425, 445, 498
CHEM 282, 371, 373, 464
GENET 305, 375, 420
IMIN 200, 324, 372, 405, 452
MATH 115
MICRB 316, 470
MMI 391
ONCOL 320, 425
PMCOL 201, 371 or ZOOL 342
ZOOL 303 or BOT 303

Cell Biology Recommended Options

ANAT 200, 400, 401
BIOCH 310, 320, 330, 410, 455, 460
BIOL 108, 208, 315, 321, 335, 380, 391, 430
BOT 382
GENET 301, 302, 364, 390, 408, 412, 418
IMIN 371, 401, 410
MICRB 311, 315, 410, 450
MMI 351, 352, 405, 415, 426, 427, 445
PHYSL 212, 214, 372, 401, 403
PMCOL 201, 202
STAT 337
ZOOL 241, 242

194.3.2 Specialization in Cell Biology

Continuation in the Specialization in Cell Biology program requires successful completion of at least ★24 with a minimum 2.3 GPA in each preceding Fall/Winter. In addition, graduation requires a minimum 2.3 GPA on all courses credited towards the degree.

Year 1

BIOL 107
CHEM 101, 102
CHEM 164 or 261
MATH 113 or 114
PHYS 124, 126
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS
★3 in approved options

Year 2

BIOCH 200
BIOL 207
CELL 201 or BIOL 201
CHEM 263
GENET 270
MICRB 265
STAT 141 or 151
★3 in an Arts option
★6 in approved options

Year 3

CELL 300, 301
★3 from BIOCH 310, 320 or 330
★6 from Group A Cell Biology options (BIOCH 401 recommended)
★9 in approved options
★6 in Arts options

Note: Cell Biology students should take BIOCH 320 in Winter Term of Year 2 if selecting BIOCH 401 option; BIOCH 330 is not required for Cell Biology students.

Year 4

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

Notes

(1) Students are required to consult the Department of Cell Biology for selection and approval of all options.
(2) Students are encouraged to select approved options from the Cell Biology Group A or recommended options list, but may also follow a course of study tailored to their interests (must be approved by a Cell Biology advisor).
(3) Credit in SCI 100 will be considered equivalent to BIOL 107, 108, CHEM 101, 102, 164, MATH 114, 115, PHYS 124, 126.

Cell Biology Group A Options:

BIOCH 401, 420, 425, 441, 450, 481, 482
BIOCH 430 or GENET 304
BIOL 421
CELL 310, 398, 402, 405, 410, 415, 425, 445, 498, 499
CHEM 282, 371, 373, 464
GENET 305, 375, 420
IMIN 200, 324, 405, 372, 452
MATH 115
MICRB 316, 470
MMI 391
ONCOL 320, 425
PMCOL 201, 371 or ZOOL 342
ZOOL 303 or BOT 303

Cell Biology Recommended Options:

ANAT 200, 400, 401
BIOCH 310, 320, 330, 410, 455, 460
BIOL 108, 208, 315, 321, 335, 380, 391, 430
BOT 382
GENET 301, 302, 364, 390, 408, 412, 418
IMIN 371, 401, 410
MICRB 311, 315, 410, 450
MMI 351, 352, 405, 415, 426, 427, 445
PHYSL 212, 214, 372, 401, 403
PMCOL 201, 202
STAT 337
ZOOL 241, 242

194.4 Chemistry

194.4.1 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 BIOCH 200, ★3 in either CHEM 400 or 401, ★6 in a junior ENGL or ★3 in ENGL 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, with ★6 of these taken at the 400-level. 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 in Chemistry program requires successful completion of at least ★24 with a minimum 3.0 GPA and a minimum 3.0 GPA on all CHEM courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA on the last ★90 credited to the degree.

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 (recommended) or PHYS 124, 126
★6 in junior ENGL or ★3 in ENGL and ★3 in an Arts option
★3 in Science option

Year 2

CHEM 211, 241, 243, 263, 282, 298
MATH 214 and either 125 or 215 or STAT 151
★6 in Arts options

Years 3 and 4

CHEM 313, 361, 363, 371, 373, 398
BIOCH 200
CHEM 400 or 401
★18 in senior chemistry courses (with at least ★6 taken at the 400-level).
★12 in Science options
★6 in Arts options

Senior Courses in Chemistry

BIOCH 310, 320, 330
CHEM 303, 305, 333, 400 (if not taken as a requirement), 401 (if not taken as a requirement), 403, 405, 419, 424, 425,434, 436, 437, 438, 439, 443, 444, 461, 462, 463, 477, 479, 483, 489, 493, 495

Note: Credit in SCI 100 will be considered equivalent to CHEM 101, 102, 164, MATH 114, 115, PHYS 144, 146, BIOL 107 and ★3 Science option.

194.4.2 Specialization in Chemistry

Continuation in the Specialization in Chemistry program requires successful completion of at least ★18 with a minimum 2.3 GPA and a minimum 2.3 GPA on all CHEM courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA on the last ★90 credited to the degree.

The Specialization 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 (recommended) or PHYS 124, 126
★6 in junior level ENGL or WRS or ★3 junior ENGL and ★3 in Arts option
★3 in Science option

Year 2

CHEM 211, 241, 243, 263, 282, 298
MATH 214 and either 125 or 215 or STAT 151
★6 in Arts options

Years 3 and 4

CHEM 313, 361, 371, 373, 398
BIOCH 200
★9 in senior chemistry courses (with at least ★3 taken at the 400-level).
★12 in Science options
★6 in Arts options
★15 in approved options

Senior Courses in Chemistry

BIOCH 310, 320, 330
CHEM 303, 305, 333, 363, 400, 401, 403, 405, 419, 424, 425, 434, 436, 437, 438, 439, 443, 444, 461, 462, 463, 477, 479, 483, 489, 493, 495

Notes

(1) Approved options are normally chosen from offerings within the Faculty of Science.
(2) All options must be selected in consultation with the Department of Chemistry.
(3) Credit in SCI 100 will be considered equivalent to BIOL 107, CHEM 101, 102, 164, MATH 114, 115, PHYS 144, 146 and ★3 Science option.

194.4.3 Science Internship Program

A Science Internship Program, similar to a co-op program, is offered to students in the General, Specialization or Honors programs in Chemistry (see §192.11 for guidelines to the program). The Science Internship designation will appear on the degree parchments of students who have participated in the program and who have also successfully completed CHEM 400.

Students should be aware that under the *Protection for Persons in Care Act*, all new employees, volunteers and other people engaged for services by designated agencies (hospitals, nursing homes, lodges, group homes, etc.) must complete a Police Information Check (also known as a Criminal Record Check, Security Clearance Check, or Police Clearance), which must include a Vulnerable Sector Check. In addition, certain other agencies, organizations, and educational facilities may require students to present a Police Information Check prior to entering a practicum, work placement term, internship, or field experience placement.

Students who have concerns related to their ability to provide a clear Police Information Check should consult with the Associate Dean, Undergraduate. Students will be informed of the need for a Police Information Check prior to specific practicum (field experience) placement. See §23.8.3 for more information on the general requirements concerning Police Information Checks and the fees associated with them.

194.5 Computing Science

For admission requirements, see §16.15.

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.

194.5.1 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 in Computing Science program requires successful completion of at least ★24 with a minimum 3.0 GPA and a minimum 3.0 GPA on all CMPUT courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA on the last ★60 and a minimum 3.0 GPA on all CMPUT courses credited towards the degree.

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.

Year 1

CMPUT 274 and 275
★6 in junior ENGL or ★3 in junior ENGL and ★3 junior WRS
★9 in Science options
★9 in approved options

Year 2

★9 in Science options
★6 in Arts options
★15 in approved options

Year 3

★15 in CMPUT at the 300-level or 400-level (see Note 3)
★9 in Science options
★3 in Arts options
★3 in approved options

Year 4

★15 in CMPUT at the 300-level or 400-level (see Note 3)
★9 in Science options
★3 in Arts options
★3 in approved options

Notes

(1) Students can take a maximum of ★42 in 100-level courses.
(2) 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.
(3) At least ★12 in CMPUT must be at the 400-level.
(4) Credit in SCI 100 will be considered equivalent to CMPUT 174 and ★24 Science options.

194.5.2 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 Science Internship Program.

Continuation in the Specialization in Computing Science program requires successful completion of at least ★18 with a minimum 2.3 GPA and a minimum 2.3 GPA on all CMPUT courses completed in the previous Fall/Winter. In addition,

graduation requires a minimum 2.3 GPA on the last ★60 and a minimum 2.3 GPA on all CMPUT courses credited towards 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 174, 175
MATH 114, 115
★6 in junior ENGL or ★3 in junior ENGL and ★3 junior WRS
★12 in options (see Notes 1, 2)

Year 2

★6 from CMPUT 201, 204, 229, 272, 291
MATH 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 141, 151 or 235) and STAT 252, or the more advanced sequence of STAT 265 and 266.
(4) At least ★6 in CMPUT must be at the 400-level.
(5) Credit in SCI 100 will be considered equivalent to CMPUT 174, MATH 114, 115 and ★18 Science options.

194.5.3 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 Science Internship Program.

Continuation in the Specialization in Computing Science - Minor in Business program requires successful completion of at least ★18 with a minimum 2.3 GPA and a minimum 2.3 GPA on all CMPUT and Business courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA on the last ★60 and a minimum 2.3 GPA on all CMPUT and Business courses credited towards 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 174, 175
MATH 114, 115
ECON 101, 102
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS
★6 in options (See Note 1)

Year 2

CMPUT 201, 204, 229, 272, 291
MATH 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)
ACCTG 311
SMO 301
★9 in options (See Note 1)

Year 4

★9 in CMPUT at the 300-level or higher (see Notes 3 and 4)
★6 from FIN 301, MARK 301, OM 352, SMO 321
★6 approved Business options (See Note 6)
★9 in options (See Note 1)

Notes

(1) Options consist of Science options, Arts options, Business options, and approved options from any Faculty. 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. 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 141, 151 or 235) and STAT 252, or the more advanced sequence of STAT 265 and 266.
(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.
(5) Credit in SCI 100 will be considered equivalent to CMPUT 174, MATH 114, 115 and ★18 options.
(6) Credit cannot be obtained for MIS 311, 415, 419, 435 and MGTSC 312.

194.5.4 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 Science 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 SIP 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 Specialization in Computing Science in Software Practice program requires successful completion of at least ★18 with a minimum 2.3 GPA and a minimum 2.3 GPA on all CMPUT and Business courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA on the last ★60 and a minimum 2.3 GPA on all CMPUT and Business courses credited towards the degree. (Note that ECON courses are not counted as Business courses.)

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 174, 175, 272 (see Note 1)
MATH 114, 115
★6 in junior ENGL or ★3 in junior ENGL and ★3 junior WRS
★6 in Science options
★3 in an approved option

Year 2

CMPUT 201, 204, 229, 291
MATH 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

SIP -8, 12, or 16 month Science Internship (Note: Students in the program who fail to obtain placement in the SIP must withdraw from the program, and must reapply to continue as a 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

Notes

(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), Management Science (MGTSC) or Operations Management (OM), with the exception of MIS 311, 415, 419, 435 and MGTSC 312. Students are required to have their selection approved by the student's advisor.
(3) Students must have ★6 in introductory statistics and probability. This can be satisfied by selecting (STAT 141, 151 or 235) and STAT 252, or the more advanced sequence of STAT 265 and 266.
(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.
(5) Credit in SCI 100 will be considered equivalent to CMPUT 174, MATH 114, 115 and ★18 options.

194.5.5 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 Computing Science Honors Stream in Bioinformatics program requires successful completion of at least ★24 with a minimum 3.0 GPA and a minimum 3.0 GPA on all CMPUT courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA on the last ★60 and a minimum 3.0 GPA on all CMPUT courses credited towards 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 274, 275, 272 (see Note 1)
MATH 114, 115 (see Note 2)
★3 in a BIOL or CHEM option
★6 in junior ENGL or ★3 in junior ENGL and ★3 junior WRS
★3 in a Science option

Year 2

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

Year 3

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

Year 4

BIOIN 401
CMPUT 366
★9 in an Arts option
★9 in CMPUT at the 300-level or higher
★3 in a GENET Option (see Note 4)
★3 in a Science 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 141, 151 or 235) and STAT 252, or the more advanced sequence of STAT 265 and 266.
(4) The ★6 in GENET options must be chosen from GENET 301, 302, 304, 305 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.
(5) Credit in SCI 100 will be considered equivalent to BIOL 107, CMPUT 174, MATH 114, 115, CHEM 101, 164 and ★6 Science options.

194.5.6 Computing Science Specialization Stream in Bioinformatics

Continuation in the Computing Science Specialization Stream in Bioinformatics program requires successful completion of at least ★18 with a minimum 2.3 GPA and a minimum 2.3 GPA on all CMPUT courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA on the last ★60 and a minimum 2.3 GPA on all CMPUT courses credited towards 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 174, 175, 272 (see Note 1)
MATH 114, 115
★3 in a BIOL or CHEM option
★6 in junior ENGL or ★3 in junior ENGL and ★3 in junior WRS
★3 in a Science option

Year 2

BIOL 207
CMPUT 201, 204, 229, 291
GENET 270
MATH 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 a Science option
★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 141, 151 or 235) and STAT 252, or the more advanced sequence of STAT 265 and 266.
(3) The ★6 in GENET options must be chosen from GENET 301, 302, 304, 305 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.

194.5.7 Science Internship Program

A Science Internship Program (SIP), is offered to students in the General, Specialization or Honors programs in Computing Science (see §192.11 for program guidelines). The Science Internship designation will appear on the

degree parchments of students who have participated in the program and who have also successfully completed CMPUT 400.

194.5.8 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 §82.6), 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 §16.7. Promotion and Graduation regulations are found in §83.3.

194.5.9 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 §193.5, 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.

194.6 Earth and Atmospheric Sciences

Earth and Atmospheric Sciences encompass the study of the atmosphere, surface and interior of the earth. The Department administers 12 academic programs: Honors and Specialization in Atmospheric Sciences, Honors and Specialization in Environmental Earth Sciences, Honors and Specialization in Geology, Honors and Specialization in Paleontology, BSc Specialization in Planning, BA Major and Minor in Human Geography, and BA Major in Planning. **For details on the Major and Minor in Human Geography and on the BA Major in Planning, see Faculty of Arts listing.**

194.6.1 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 successful completion of at least ★24 with a minimum of 3.0 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA 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 174
EAS 100
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS
MATH 113 or 114, 115
MATH 125 or 127
PHYS 144 and 146
STAT 141 or 151

Year 2

EAS 212, 221, and 270
EAS 294 or HGP 250
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
★3 in Science options (see Note 1 below)
★3 in Open option (see Note 2 below)

Year 4

EAS 426
EAS 470, 471 and 475
★12 in Science options (see Note 1 below)
★3 in Open option (see Note 2 below)

Notes

(1) Students are recommended to consult Advisor for approved Science options.
(2) Open option – Chosen from any credit course offered by the University of Alberta
(3) For students in the Science Internship Program: EAS 401, WKEXP 955, 956.
(4) Recommended Arts options include any EAS X9X courses or any HGP courses.
(5) For students entering Atmospheric Science Honors, credit in SCI 100 will be considered equivalent to CMPUT 174, EAS 100, MATH 113, 115, PHYS 144, 146 and ★9 Science options equivalent to CHEM 101, 102 and EAS 105.

194.6.2 Specialization in Atmospheric Sciences

Continuation in the Specialization in Atmospheric Sciences program requires successful completion of at least ★18 with a minimum 2.3 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA 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 174
EAS 100
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS
MATH 113 or 114, 115
MATH 125 or 127
PHYS 144 and 146
STAT 141 or 151

Year 2

EAS 212, 221, and 270
EAS 294 or HGP 250
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
★3 in Science option (see Note 1 below)
★3 in Open option (see Note 2 below)

Year 4

EAS 470, 471 and 475
★18 in Science options (see Note 1 below)
★3 in Open option (see Note 2 below)

Notes

(1) Students are recommended to consult Advisor for approved Science options.
(2) Open option – Chosen from any credit course offered by the University of Alberta
(3) For students in the Industrial Internship Program: EAS 401, WKEXP 955, 956.
(4) Recommended Arts options include any EAS X9X courses or any HGP courses.
(5) For students entering Atmospheric Science Specialization, credit in SCI 100 will be considered equivalent to CMPUT 174, EAS 100, MATH 113, 115, PHYS 144, 146 and ★9 Science options equivalent to CHEM 101, 102 and EAS 105.

194.6.3 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 successful completion of at least ★24 with a minimum 3.0 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA 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 ENGL or ★3 junior ENGL and ★3 junior WRS
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 either 212 or 270
EAS 294 or HGP 250
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 Science Internship Program: EAS 401, WKEXP 955, 956.
(3) For students entering Environmental Earth Science Honors, credit in SCI 100 will be considered equivalent to BIOL 108, CHEM 101, 102, EAS 100, 105, MATH 113, 115, PHYS 144 and 146.

194.6.4 Specialization in Environmental Earth Sciences

Continuation in the Specialization in Environmental Earth Sciences program requires successful completion of at least ★18 with a minimum 2.3 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA 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 or ★3 junior ENGL and ★3 junior WRS
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 either 212 or 270
EAS 294 or HGP 250
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 Science Internship Program: EAS 401, WKEXP 955, 956.
(3) For students entering Environmental Earth Science Specialization, credit in SCI 100 will be considered equivalent to BIOL 108, CHEM 101, 102, EAS 100, 105, MATH 113, 115, PHYS 144 and 146.

194.6.5 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 successful completion of at least ★24 with a minimum 3.0 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA 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 ENGL or ★3 junior ENGL and ★3 junior WRS
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 or any HGP courses.
(2) For students in the Science Internship Program: EAS 401, WKEXP 955, 956.
(3) For students entering Geology Honors, credit in SCI 100 will be considered equivalent to BIOL 108, CHEM 101, 102, EAS 100, 105, MATH 113, 115, PHYS 144 and 146.

194.6.6 Specialization in Geology

Continuation in the Specialization in Geology program requires successful completion of at least ★18 with a minimum 2.3 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA 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 or ★3 junior ENGL and ★3 junior WRS
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 or any HGP courses.
(2) For students in the Science Internship Program: EAS 401, WKEXP 955, 956.
(3) For students entering Geology Specialization, credit in SCI 100 will be considered equivalent to BIOL 108, CHEM 101, 102, EAS 100, 105, MATH 113, 115, PHYS 144 and 146.

194.6.7 Honors and Specialization in Paleontology

See §194.13 for details on the Honors and Specialization Paleontology programs.

194.6.8 Specialization in Planning

The Planning program educates students in the scientific, aesthetic, and orderly disposition of land, resources, facilities and services with a view to securing the physical, economic and social efficiency, health and well-being

of communities. Planners work for all levels of government and in professional planning consultancies

The Department of Earth and Atmospheric Sciences offers a BA major in Planning and a BSc Specialization in Planning. Students interested in focusing on natural science elements of planning, including environmental management and the use of geographic information sciences, should consider the BSc program and those interested in the aesthetic, economic, and social issues of planning should consider the BA program (see §44.24 of the Calendar).

Continuation in the Specialization in Planning program requires a minimum 2.3 GPA on at least ★18 in the previous Fall/Winter. To graduate in four years, a student needs ★30 per year.

Graduation requires a minimum 2.3 GPA on the last ★60 credited to the degree. A student enrolling in the Specialization program should confer with the Planning program student advisor before registration.

Year 1

BIOL 108
EAS 100 and 105
★6 junior ENGL/WRS
HGP 100
MATH 113 or 114 or 120
STAT 141 or 151
★3 option
★3 Science options

Year 2

BIOL 208
EAS 221, 225 and 250
HGP 210, 211, 240, 250
★6 Science options

Year 3

EAS 351
HGP 310, 315, 316, 317, 355 (see Note 3) and 399
★6 Approved courses (see Note 1 below)
★3 Science options (see Note 3)

Year 4

HGP 410, 412, 470 (see Note 3) and 495
★9 from List A (see Note 1 below)
★9 Science options (see Note 3 below)

Notes

(1) List A courses include: BIOL 299, 330, 331, 332, 333, 364, 365, 366, 381, 464 and 470; EAS 323, 324, 327, 401, 425, 451, 452, 457, 458.
(2) For students entering the Science Internship Program: EAS 401, WKEXP 955, 956 are required.
(3) HGP 355, 381, 470 and 485 may be used as a Science courses by students in the BSc Specialization in Planning program.

194.6.9 Science Internship Program

A Science Internship Program is offered to students in the General, Specialization or Honors programs in Earth and Atmospheric Sciences (see §192.11 for guidelines to the program). The Science Internship designation will appear on the degree parchments of students who have participated in the program and who have also successfully completed EAS 401.

194.6.10 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 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.

194.7 Geophysics

The Department of Physics offers two programs dealing with solid earth physics. The Honors in Geophysics program (see §194.15.5) 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 §194.15 (Physics).

194.7.1 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.

194.8 Immunology and Infection

194.8.1 Honors in Immunology and Infection

Continuation in the Honors in Immunology and Infection program requires successful completion of at least ★24 with a minimum 3.0 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA on the last ★60 credited to the degree.

Year 1

BIOL 107, 108
CHEM 101, 102, 261 (164)
★3 in MATH 113, 114 or 125
STAT 141 or 151
★3 Approved Option
★6 Arts options (junior level ENGL or junior WRS recommended)

Year 2

BIOCH 200
BIOL 201, 207, 208
CHEM 263
IMIN 200
MICRB 265
★6 Arts options
★3 from GENET 270 or BIOCH 330 (see Note 1)

Years 3 and 4

★3 from BIOCH 430, GENET 304 or MICRB 316
★3 from BIOL 391, IMIN 391 or MMI 391
IMIN 324, 371, 452
MMI 351
ZOOL 241 and 242; or PHYSL 210; or PHYSL 212 and 214
ZOOL 352
BIOL 499 or MMI 499
★6 Arts options
★9 from the List below (see Note 2)
★12 in approved options from the List below or approved by the Departmental Advisor

List

BIOCH 320, 330, 430, 450
BIOL 409
CELL 300
ENT 378
GENET 304
IMIN 372, 401, 405, 410
MICRB 316, 410
MMI 352, 405, 415, 426, 427, 436, 445
ZOOL 354, 452

Notes

(1) GENET 270 is the prerequisite for GENET 304 and MICRB 316, while BIOCH 320 and 330 are prerequisites for BIOCH 430.
(2) At least ★3 must be in a course with a laboratory component.
(3) 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

(4) Credit in SCI 100 will be considered equivalent to BIOL 107, 108, CHEM 101, 102, 164, MATH 114 and ★9 approved options.

194.8.2 Specialization in Immunology and Infection

Continuation in the Specialization in Immunology and Infection program requires successful completion of at least ★24 with a minimum 2.3 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA on all courses credited to the degree.

Year 1

BIOL 107, 108
CHEM 101, 102
CHEM 164 or 261
MATH 113 or 114 or 125
STAT 141 or 151
★3 Approved Option
★6 Arts options (junior level ENGL or junior WRS recommended)

Year 2

BIOCH 200
BIOL 201
BIOL 207, 208
CHEM 263
IMIN 200
MICRB 265
★3 from GENET 270 or BIOCH 330 (see Note 1)
★6 Arts options

Years 3 and 4

ZOOL 241 and 242 or PHYSL 210 or 212 and 214
One of: BIOCH 430; GENET 304; MICRB 316
IMIN 324, 371, 452
MMI 351
ZOOL 352
★6 Arts options
★9 from the List below (see Note 2)
★21 in approved options from the List below or options approved by an advisor (see Note 3)

List

BIOCH 320, 330, 430, 450
BIOL 391, 409
CELL 300
ENT 378
GENET 304
IMIN 372, 391, 401, 405, 410
MICRB 316, 410
MMI 352, 391, 405, 415, 426, 427, 436, 445
ZOOL 354, 452

Notes

(1) GENET 270 is the prerequisite for GENET 304, MICRB 316; while BIOCH 320 and 330 are prerequisites for BIOCH 430.
(2) At least ★3 must be in a course with a laboratory component.
(3) 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.
(4) Credit in SCI 100 is considered equivalent to BIOL 107, 108, CHEM 101, 102, 164, MATH 114 and ★9 approved options.

194.9 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, with summer and fall programs providing 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.

In addition to tuition paid to the University there are room and board fees payable to BMSC. Information concerning course prerequisites and application procedures for Marine Science may be obtained from BMSC, the Department of Biological Sciences or the Office of the Dean of Science. Permission to register in these courses is available from the University Programs Coordinator of the Bamfield Marine Sciences Centre, to whom application should be made. See BMSC website bms.bc.ca/university.html.

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

See also BMSC website bms.bc.ca/university.html for courses offered in the current year.

194.10 Mathematical and Statistical Sciences

194.10.1 Honors in Mathematics

Continuation in the Honors in Mathematics program requires successful completion of at least ★24 with a minimum 3.0 GPA in the previous Fall/Winter. Graduation requires the successful completion of at least ★24 with a minimum 3.0 GPA in each Fall/Winter.

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

Year 1

MATH 117, 118, 127, 227
★6 in an approved Science option
★6 in approved Arts options
★6 in approved options

Year 2

MATH 217, 317, 328, either 326 or 334
★6 in approved Science options
★6 in approved Arts options
★6 in approved options

Years 3 and 4

MATH 326, 334, 411, 417, 418, 424, 447, 448 and 499
★9 in approved Science options including ★3 in CMPUT or STAT
★6 in approved Arts options
★18 in approved options

Notes

(1) Several of the required courses, including MATH 411, 424, 447, and 448, may only be offered in alternate years.
(2) ECON 299, 386 or 387 may not be used for credit in any Honors degree offered by the Department of Mathematical and Statistical Sciences.
(3) SCI 100 will be considered equivalent to MATH 114, 115, CMPUT 174 and ★18 Science options.

The Department also offers a BA in Honors in Mathematics (see §44.18.1).

194.10.2 Honors in Mathematics, Minor in Computing Science

In addition to the program requirements described in §194.10.1, the student's program must include CMPUT 174 (or 274), 175 (or 275), 204, 272, 304, and ★9 in CMPUT at the 300-level or higher.

194.10.3 Honors in Mathematics, Minor in Statistics

In addition to the program requirements described in §194.10.1, the student's program must include STAT 265, 266, and at least ★18 in STAT options at the 300-level or higher with at least 6 at the 400-level.

194.10.4 Specialization in Mathematics

Continuation in the Specialization in Mathematics program requires successful completion of at least ★24 with a minimum 2.3 GPA and a minimum 2.3 GPA on all MATH courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA and a minimum 2.3 GPA on all MATH courses taken in the last Fall/Winter of the degree, as well as a minimum 2.3 GPA on all courses credited towards the degree and a minimum 2.3 GPA on all MATH 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

MATH 114, 115
MATH 125
CMPUT 174 and 175
★6 in junior ENGL, or ★3 junior ENGL and ★3 junior WRS
★3 in an approved Science option
★6 in approved options

Year 2

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

Year 3

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

Year 4

★12 in approved MATH options at the 300-level or higher
★6 in approved Science options
★12 in approved 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) A student presenting the Honors Calculus sequence MATH 117/118/217/317 must substitute MATH options for MATH 314 and 414
(5) Credit will not be given for ECON 299, 386 or 387.
(6) Credit for SCI 100 will be considered equivalent to MATH 114, 115, CMPUT 174 and ★18 Science options.

194.10.5 Specialization in Mathematics - Computational Science

Continuation in the Specialization in Mathematics - Computational Science program requires successful completion of at least ★24 with a minimum 2.3 GPA and a minimum 2.3 GPA on all CMPUT, MATH and STAT courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA and a minimum 2.3 GPA on all CMPUT, MATH and STAT courses taken in the last Fall/Winter of the degree, as well as a minimum 2.3 GPA on all courses credited towards the degree and a minimum 2.3 GPA on all CMPUT, 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 174 and 175
MATH 114, 115, 125
★6 in a junior ENGL, or ★3 junior ENGL and ★3 junior WRS
★9 in approved options

Year 2

CMPUT 201, 204, 272
MATH 214, 215, 222, 225
STAT 265
★6 in approved Arts options

Year 3

CMPUT 229, 291
MATH 228, 381
STAT 266
★3 in approved MATH or STAT options
★3 in approved Arts options
★9 in approved 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 approved Arts options
★12 in approved 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, 371, 378, 471, 479.
(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) Each student's program must have the approval of the Department of Mathematical and Statistical Sciences.
(7) Credit will not be given for ECON 299, 386 or 387.
(8) Credit in SCI 100 will be considered equivalent to CMPUT 174, MATH 114, 115 and ★18 options.

194.10.6 Honors in Applied Mathematics

Continuation in the Honors in Applied Mathematics program requires successful completion of at least ★24 with a minimum 3.0 GPA in the previous Fall/Winter. Graduation requires the successful completion of at least ★24 with a minimum 3.0 GPA in each Fall/Winter.

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

Year 1

MATH 117, 118, 127, 227
★6 in approved Science options
★6 in approved Arts options
★6 in approved options

Year 2

MATH 217, 317, 325 or 326 or 328, 334
★6 in approved Science options
★6 in approved Arts options
★6 in approved options

Years 3 and 4

★21 in Mathematics including MATH 337, 381, 411, 417, 436, 499
★6 in approved options at the 300-level or higher in the field of application
★3 in an approved 300- or 400-level MATH or MA PH
★3 in CMPUT or STAT option
★9 in approved Science options
★6 in approved Arts options
★12 in approved options

Notes

(1) Several of the required courses, including MATH 411, may only be offered in alternate years.
(2) ECON 299, 386 or 387 may not be used for credit in any Honors degree offered by the Department of Mathematical and Statistical Sciences.
(3) SCI 100 will be considered equivalent to MATH 114, 115, CMPUT 174 and ★18 Science options.

Honors in Mathematical Physics

See §194.15.7 for details.

194.10.7 Honors in Applied Mathematics, Minor in Computing Science

In addition to the program requirements described in §194.10.6, the student's program must include CMPUT 174 (or 274), 175 (or 275), 204, 272, 304, and ★9 in CMPUT at the 300-level or higher.

194.10.8 Honors in Applied Mathematics, Minor in Statistics

In addition to the program requirements described in §194.10.6, the student's program must include STAT 265, 266, and at least ★18 in STAT options at the 300-level or higher with at least ★6 at the 400-level.

194.10.9 Honors in Mathematics and Economics

Continuation in the Honors in Mathematics and Economics program requires successful completion of at least ★24 with a minimum 3.0 GPA in the previous Fall/Winter. Graduation requires the successful completion of at least ★24 with a minimum 3.0 GPA in each Fall/Winter.

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 117, 118, 127, 227
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS
★6 in approved Science options

Year 2

ECON 281, 282
MATH 217, 317, 325 or 326 or 328
STAT 265, 266
★3 in approved Science options
★6 in approved options

Years 3 and 4

ECON 384, 385, 399, 481, 482, 497
★6 in Economics options
★12 from MATH 334, 373, 381, 411, 417, 421, 422, 481
★12 in MATH or STAT courses
★6 in approved Science options
★6 in approved options

Notes
(1) Credit is not granted for ECON 299, 386 or 387.
(2) Credit in SCI 100 will be considered equivalent to MATH 114, 115, ★15 Science options and ★6 approved options.

194.10.10 Specialization in Mathematics and Economics

Continuation in the Specialization in Mathematics and Economics program requires successful completion of at least ★24 with a minimum 2.3 GPA and a minimum 2.3 GPA on all ECON, MATH and STAT courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA and a minimum 2.3 GPA on all ECON, MATH and STAT courses taken in the last Fall/Winter of the degree, as well as a minimum 2.3 GPA on all courses credited towards the degree and a minimum 2.3 GPA on all ECON, 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

ECON 101, 102
MATH 114, 115, 125
STAT 151
★6 junior ENGL, or ★3 junior ENGL and ★3 junior WRS
★3 in an approved Science option
★3 in an approved option

Year 2

CMPUT 174, 175
ECON 281, 282
MATH 214, 215, 225
STAT 265, 266
★3 in an approved option

Years 3 and 4

ECON 384 (or an approved ECON option at the 400-level or higher), 385 (or an approved ECON option at the 400-level or higher), 399
★15 in approved ECON options, of which at least ★3 must be at the 400-level or higher
★18 in approved MATH or STAT options, of which at least ★12 must be at the 300-level or higher
★3 in an approved Science option
★15 in approved options

Notes
(1) Credit will not be given for ECON 299, 386 or 387.
(2) Students who are considering graduate work in Economics should take ECON 497.
(3) A Student must take at least ★6 in ECON, MATH, or STAT in each Fall/Winter of the program.
(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) Credit in SCI 100 will be considered equivalent to MATH 114, 115, CMPUT 174, ★12 Science options and ★6 options.

194.10.11 Honors in Mathematics and Finance

Continuation in the Honors in Mathematics and Finance program requires successful completion of at least ★24 with a minimum 3.0 GPA and a minimum 3.0 GPA on all ACCTG, ECON, FIN, MATH, MGTSC, OM and STAT courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA and a minimum 3.0 GPA on all ACCTG, ECON, FIN, MATH, MGTSC, OM and STAT courses taken in the last Fall/Winter of the degree, as well as a minimum 3.0 GPA on all courses credited towards the degree and a minimum 3.0 GPA on all ECON, FIN, MATH, MGTSC, OM 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 174 and 175
ECON 101, 102
MATH 117 (or 114), 118 (or 115), 127 (or 125)
STAT 151
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS

Year 2

ACCTG 311
ECON 281
MATH 217 (or 214), 317 (or 215), 227 (or 225), 253
OM 352
STAT 265, 266
★3 in approved options

Year 3

FIN 301
FIN 412
MATH 334, 337, 356, 357
STAT 371
★6 in approved MATH options [see note (4)]
★3 in approved options

Year 4

ECON 399 or STAT 378
FIN 413
MATH 373, 417, and 408 or 415
STAT 471
★3 in approved FIN options
★9 in approved 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. ★33 in ACCTG, ECON, FIN, MGTSC or OM, including ★9 in 400-level FIN
(2) Approved ACCTG, ECON, FIN and MGTSC options include ACCTG 322, 412, 432, 443; ECON 282, 384, 385, 399, 408, 481, 482; FIN 412, 413, 414, 416, 422, 434, 442; MGTSC 404, 405. Credit will not be given for ECON 299, 386 or 387.
(3) Recommended Science options include: MATH 381, 418, 432, 436, 481, 499; STAT 353, 472, 479; CMPUT 201.
(4) A student not presenting the Honors Calculus sequence MATH 117/118/217/317 must take MATH 314 and 414.
(5) Credit in SCI 100 will be considered equivalent to CMPUT 174, MATH 114, 115 and ★18 options.

194.10.12 Specialization in Mathematics and Finance

Continuation in the Specialization in Mathematics and Finance program requires successful completion of at least ★24 with a minimum 2.3 GPA and a minimum 2.3 GPA on all ACCTG, ECON, FIN, MATH, MGTSC, OM and STAT courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA and a minimum 2.3 GPA on all ACCTG, ECON, FIN, MATH, MGTSC, OM and STAT courses taken in the last Fall/Winter of the degree, as well as a minimum 2.3 GPA on all courses credited towards the degree and a minimum 2.3 GPA on all ECON, FIN, MATH, MGTSC, OM 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 174 and 175
ECON 101, 102
MATH 114, 115, 125
STAT 151
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS

Year 2

ACCTG 311
ECON 281
MATH 214, 215
MATH 225, 253
OM 352
STAT 265, 266
★3 in approved options

Year 3

FIN 301
MATH 314, 356, 357
STAT 371
★3 in an approved FIN option
★12 in approved options

Year 4

ECON 399 or STAT 378
MATH 373
STAT 471
★6 in approved FIN options
★15 in approved 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, MGTSC or OM, including ★9 in 400-level FIN

(2) Approved ACCTG, ECON, FIN and MGTSC options include ACCTG 322, 412, 432, 443; ECON 282, 384, 385, 399, 408, 481, 482; FIN 412, 413, 414, 416, 422, 434, 442; MGTSC 404, 405. Credit will not be given for ECON 299, 386 or 387.
(3) Recommended Science options include: MATH 334, 337, 381, 432, 481; STAT 353, 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) A student presenting the Honors Calculus sequence MATH 117/118/217/317 must substitute a MATH option for MATH 314.
(6) Credit in SCI 100 will be considered equivalent to CMPUT 174, MATH 114, 115 and ★18 options.

194.10.13 Honors in Mathematical Physics

See §194.15.7 for details.

194.10.14 Honors in Statistics

Continuation in the Honors Statistics program requires successful completion of at least ★24 with a minimum 3.0 GPA and a minimum 3.0 GPA on all MATH and STAT courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA and a minimum 3.0 GPA on all MATH and STAT courses taken in the last Fall/Winter of the degree, as well as a minimum 3.0 GPA on all courses credited towards the degree and a minimum 3.0 GPA on all MATH and STAT courses credited towards the degree.

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

Year 1

CMPUT 174 and 175
★6 junior ENGL, or ★3 junior ENGL and ★3 junior WRS
MATH 114 (or 117), 115 (or 118), 125 (or 127)
STAT 151
★6 in approved options

Year 2

MATH 214 (or 217), 215 (or 317), 225 (or 227)
STAT 252, 265, 266
★6 in approved Arts options
★3 in approved Science options
★3 in an approved option

Years 3 and 4

MATH 314 or 417
MATH 414 or 418
STAT 361, 368, 371, 372, 378, 471, 499
★12 in STAT options at the 400-level
★6 in approved Arts options
★15 in approved Science options

Notes
(1) Credit will not be granted for ECON 299, 386 or 387.
(2) Credit in SCI 100 will be considered equivalent to CMPUT 174, MATH 114, 115 and ★18 approved Science options.

194.10.15 Specialization in Statistics

Continuation in the Specialization in Statistics program requires successful completion of at least ★24 with a minimum 2.3 GPA and a minimum 2.3 GPA on all MATH and STAT courses completed in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA and a minimum 2.3 GPA on all MATH and STAT courses taken in the last Fall/Winter of the degree, as well as a minimum 2.3 GPA on all courses credited towards the degree and a minimum 2.3 GPA on all MATH and STAT courses credited towards the degree.

Year 1

CMPUT 174 and 175
MATH 114, 115, 125
STAT 151
★6 junior ENGL, or ★3 junior ENGL and ★3 junior WRS
★6 in approved options

Year 2

MATH 214, 215, 225
STAT 252, 265, 266
★6 in approved Arts options
★6 in approved Science options
★3 in approved options

Years 3 and 4

STAT 361, 368, 371, 372, 378
★12 in STAT options at 300- and 400-level
★6 in approved Arts options
★6 in approved Science options
★18 in approved options

Notes
(1) A corresponding Honors MATH course can be substituted for any MATH course listed. For example, MATH 117 can be substituted for MATH 114.
(2) Credit will not be granted for ECON 299, 386 or 387.
(3) Credit in SCI 100 will be considered equivalent to CMPUT 174, MATH 114, 115 and ★18 approved Science options.

194.10.16 Science Internship Program

A Science Internship Program, similar to a co-op program, is offered to students in the General, Specialization or Honors programs in Mathematical and Statistical Sciences (see §192.11 for guidelines to the program). The Science Internship designation will appear on the degree parchments of students who have participated in the program and who have also successfully completed MATH or STAT 400.

194.11 Neuroscience

194.11.1 Honors in Neuroscience

The Honors program in Neuroscience is an interdisciplinary program coordinated by the Neuroscience and Mental Health Institute. This program is for students planning a career in Neuroscience.

For admission to the Honors in Neuroscience program see Admission Chart 7, §16.15.

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 Neuroscience and Mental Health Institute.

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
CHEM 101, 261
★6 junior ENGL or WRS
MATH 113 or 114
MATH 115 or STAT 141 or 151
PHYS 124, 126
PSYCO 104

Year 2

BIOCH 200
BIOL 207
CHEM 263
NEURO 210
PHYSL 212, 214 (Students must be manually enrolled in both courses by the Department of Physiology. Registration via Bear Tracks is not possible.)
PSYCO 275
★6 in Science options
★3 in Arts options

Year 3

NEURO 375
PMCOL 371 or ZOOL 342 but not both.
PHYSL 372
One of PSYCO 371, 375, 377; GENET 270, 390; ZOOL 344
★12 in approved options
★6 in Arts options

Year 4

Honors neuroscience students may choose from two research streams during their fourth year of study. Research Stream A (Independent Study and Laboratory Research) allows for ★6 or ★9 of independent study and research in one or more labs in the Neuroscience and Mental Health Institute. This stream provides flexibility and allows for exposure to multiple research areas. Research Stream B (Undergraduate Honors Thesis in Neuroscience) involves ★12 in independent study and research to be performed in the lab of a single faculty member in the Neuroscience and Mental Health Institute, with the development of an undergraduate honors research thesis. This option is therefore a more intensive research experience allowing for more time and independent study in a neuroscience lab, and will culminate with a written research thesis and oral thesis defense.

Research Stream A (Independent Study and Laboratory Research):
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; 512; PSYCO 478.
★6 chosen from the following courses covering topics in Systems and Cognitive Neuroscience: NEURO 443, 472, 496; PHYSL 403, 405; PSYCI 511; PSYCO 471, 475.
★6 (if NEURO 450, 451 and 452 are taken) or ★9 (if NEURO 450 and one of NEURO 451 or 452 are taken) of Science options approved by the program coordinator.
★3 in Arts options

OR

Research Stream B (Undergraduate Honors Thesis in Neuroscience):
★6 NEURO 498 and ★6 NEURO 499
★6 chosen from the following courses covering topics in Cellular and Molecular Neuroscience: NEURO 410; PHYSL 444; PMCOL 412, 512; PSYCO 478
★6 chosen from the following courses covering topics in Systems and Cognitive Neuroscience: PSYCO 471; PHYSL 403, 405; NEURO 443, 472, 496; PSYCI 511.
★3 of Science options approved by the program coordinator
★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 Outside (non-Science, non-Arts) courses;
   d. no more than ★42 at the junior level.
(2) Each student's program must have the approval of the Neuroscience and Mental Health Institute.
(3) Approved Science options in Years 1-3 may be chosen from Science departments including BIOCH, BIOL, CELL, CHEM, CMPUT, EAS, ENT, GENET, IMIN, MATH, MICRB, PMCOL, PHYS, PHYSL, PSYCO, STAT. 300- and 400-level options are preferable in Years 3 and 4. Science options must be approved by the program coordinator for the Neuroscience and Mental Health Institute Undergraduate Honors Program.
(4) Courses in Faculties outside of the Faculty of Science and Arts that may be used as approved Outside (non-Science, non-Arts) options include: ANAT 200, 400; LABMP 400; PTHER 567, and BME 520. All other Outside options require prior approval by the Neuroscience and Mental Health Institute.
(5) In the fourth year, all students must successfully complete an individual study program with members of the Neuroscience and Mental Health Institute. This program can be chosen from either Research Stream A (Independent Study and Laboratory Research) or Research Stream B (Undergraduate Honors Thesis in Neuroscience).
(6) Credit in SCI 100 will be considered equivalent to BIOL 107, 108, CHEM 101, 164, MATH 114, 115, PHYS 144, 146 and PSYCO 104.

194.12 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.

194.13 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.

194.13.1 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.

Continuation in the Honors in Paleontology program requires successful completion of at least ★24 with a minimum 3.0 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA on the last ★60 credited to the degree.

Year 1

BIOL 107 and 108
CHEM 101 or 164
EAS 100 and 105
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS
MATH 113 or 114 or 125
STAT 141 or 151
★3 Science option

Years 2, 3, and 4

BIOL 207, 208, 321 and 335
BIOL 499 or EAS 426
EAS 222, 230, 233 and 234
EAS 336 or ZOOL 325
★6 PALEO 4XX and/or EAS 4XX
ZOOL 224 or 250
★21 in Science from approved courses below (see note)
★12 in approved Arts options
★15 Open options (including Science courses below)

Recommended option courses for Vertebrate Paleontology:

BIOL 315, 361, 364, 398, 399, 421, 498
MA SC 412
PALEO 400, 412, 414, 418, 419
ZOOL 224, 325, 405, 406, 407, 408

Recommended option courses for Invertebrate Paleontology:

BIOL 315, 361, 364, 398, 399, 421, 498
BOT 205, 308, 321
EAS 110, 208, 225, 270, 320, 336, 364, 373, 421, 457, 460, 462, 465
ENT 220, 427
MA SC 410
PALEO 412, 414
ZOOL 250

Notes

(1) Some courses are offered in alternate years only, so plan your schedule appropriately.
(2) Approved Arts options: ANTHR 209, 390, 391; CHRTC 350, 451; PHIL 265, 317.
(3) Approved options: BIOL 299, 315, 361, 364, 398, 399, 421, 498, 499; BOT 205, 306, 308, 314, 321, 384; EAS 110, 207, 208, 221, 224, 225, 250, 270, 320, 336, 364, 373, 421, 426, 427, 428, 457, 460, 462, 465; ENT 220, 427; GEOPHY 223, 224; MA SC 410, 412, 430; PALEO 400, 412, 414, 418, 419; ZOOL 224, 250, 325, 405, 406, 407, 408. For information regarding additional approved options, please consult your program advisor.
(4) For students entering Paleontology Honors, credit in SCI 100 will be considered equivalent to BIOL 107, 108, CHEM 101, EAS 100, 105, MATH 113, 115, PHYS 144 and 146.
(5) Please refer to the Association of Professional Engineers and Geoscientists of Alberta (APEGA) course requirements when choosing courses if you wish to apply to APEGA for Professional Geoscientist status following the completion of your degree.

194.13.2 Specialization in Paleontology

Continuation in the Specialization in Paleontology program requires successful completion of at least ★18 with a minimum 2.3 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA on all courses credited to the degree.

Year 1

BIOL 107 and 108
CHEM 101 or 164
EAS 100 and 105
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS
MATH 113 or 114 or 125
STAT 141 or 151
★3 Science option

Years 2, 3, and 4

BIOL 207 and 208, 321 and 335
EAS 222, 230, 233 and 234; EAS 336 or ZOOL 325
★6 PALEO 4XX and/or EAS 4XX
ZOOL 224 or 250
★21 in Science from approved courses below (see note)
★12 in approved Arts options
★21 Open options (including Science courses below)

Recommended option courses for Vertebrate Paleontology:

BIOL 315, 361, 364, 421, 398, 399, 498
MA SC 412
PALEO 400, 412, 414, 418, 419
ZOOL 224, 325, 405, 406, 407, 408

Recommended option courses for Invertebrate Paleontology:

BIOL 315, 361, 364, 421, 398, 399, 498
BOT 205, 308, 321
EAS 110, 208, 225, 270, 320, 336, 364, 373, 421, 457, 460, 462, 465
ENT 220, 427
MA SC 410
PALEO 412, 414
ZOOL 250

Notes

(1) Some courses are offered in alternate years only, so plan your schedule appropriately.
(2) Approved Arts options: ANTHR 209, 390, 391; CHRTC 350, 451; PHIL 265, 317.
(3) Approved options: BIOL 299, 315, 361, 364, 421, 398, 399, 498, 499; BOT 205, 306, 308, 314, 321, 384; EAS 110, 207, 208, 221, 224, 225, 250, 270, 320, 336, 364, 373, 421, 426, 427, 428, 457, 460, 462, 465; ENT 220, 427; GEOPH 223, 224; MA SC 410, 412, 430; PALEO 400, 412, 414, 418, 419; ZOOL 224, 250, 325, 405, 406, 407, 408. For information regarding additional approved options, please consult your program advisor.
(4) For students entering Paleontology Specialization, credit in SCI 100 will be considered equivalent to BIOL 107, 108, CHEM 101, EAS 100, 105, MATH 113, 115, PHYS 144 and 146.
(5) Please refer to the Association of Professional Engineers and Geoscientists of Alberta (APEGA) course requirements when choosing courses if you wish to apply to APEGA for Professional Geoscientist status following the completion of your degree.

194.14 Pharmacology

194.14.1 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 in the Honors in Pharmacology program requires successful completion of ★30 with a minimum 3.3 GPA, a minimum 3.3 GPA on all Science courses taken and a minimum 3.3 GPA in PMCOL courses taken in each previous Fall/Winter with at least a grade of B in each course.

Year 1

BIOL 107
CHEM 101, 102, 164 or 261
★6 in Arts options ENGL recommended
STAT 141 or 151
★9 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 212 and 214
PMCOL 201, 202
★6 in Arts options

Year 3

PMCOL 303, 305, 337, 343, 344
BIOCH 320, 330
★3 in Science options as indicated in Year 1
★3 in Arts options
★3 in approved options

Year 4

PMCOL 498
★6 in Arts options
★3 in Science option as indicated in Year 1
★15 from the following: PMCOL 412, 415, 416, 425, 450, 475

Notes

(1) 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.
(2) Credit in SCI 100 will be considered equivalent to BIOL 107, 108, CHEM 101, 102, 164, MATH 114, 115 and ★6 Science options.
(3) Students who take PMCOL 498 may not take PMCOL 401 or PMCOL 402.

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

194.14.2 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 in the Specialization in Pharmacology program requires successful completion of at least ★24 with a minimum 2.7 GPA, a minimum 2.7 GPA on all Science courses taken and a minimum 2.7 GPA on all PMCOL courses taken in each previous Fall/Winter.

Year 1

BIOL 107
CHEM 101, 102, 164 or 261
★6 in Arts options ENGL recommended
STAT 141 or 151
★9 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 212 and 214
PMCOL 201, 202
★6 in Arts options

Year 3

PMCOL 323, 305, 337, 343, 344
BIOCH 320, 330
★3 in Science options as indicated in Year 1
★3 in Arts options
★3 in approved options

Year 4

★15 from PMCOL 401, 402, 412, 415, 416, 425, 450, 475
★3 in Science options as indicated in Year 1
★3 in Arts options
★9 in approved options

Notes

(1) 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.
(2) Credit in SCI 100 will be considered equivalent to BIOL 107, 108, CHEM 101, 102, 164, MATH 114, 115 and ★6 Science options.

Recommended Science options: BIOCH 310, 401, 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.

Note: 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, 401, 402, 412, 415, 416, 425, 442, 450, 475 and 498.

194.15 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.

Notes

(1) Students interested in the Engineering-Physics program should consult §82.8 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.

194.15.1 Honors in Physics

Continuation in the Honors in Physics program requires successful completion of at least ★24 with a minimum 3.0 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA on the last ★90 credited to the degree.

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:** MA PH 451; all 400-level MATH; PHYS 458, 467.
(4) **PH Pool options:** ASTRO 320, 322; EAS 370, 371, 373; all 300- and 400-level GEOPH; 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.
(5) Credit in SCI 100 will be considered equivalent to MATH 114, 115, PHYS 144, 146 and ★6 Science options.

Year 1

MATH 144 (or 117), 146 (or 118)
MATH 125 (or 127), 225 (or 227)
PHYS 144, 146
★6 in Science options
★6 in an Arts options (see Note 1 above)

Year 2

MATH 214 (or 217), 215 (or 317)
PHYS 234, 244, 271, 281, 295, 297
★6 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)

194.15.2 Specialization in Physics

Continuation in the Specialization in Physics program requires successful completion of at least ★24 with a minimum 2.3 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA on the last ★90 credited to the degree.

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.
(5) Credit in SCI 100 is considered equivalent to MATH 114, 115, PHYS 144, 146 and ★6 Science options.

Year 1

MATH 144 (or 117), 146 (or 118), 125 (or 127), 225 (or 227)
PHYS 144, 146
★6 in Science options
★6 in Arts options (see Note 1 above)

Year 2

MATH 214 (or 217), 215 (or 317)
PHYS 234, 244, 271, 281, 295, 297
★6 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)

194.15.3 Honors in Astrophysics

Continuation in the Honors in Astrophysics program requires successful completion of at least ★24 with a minimum 3.0 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA on the last ★90 credited to the degree.

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 397; MA PH 451; all 400-level ASTRO, GEOPH, PHYS, and MATH courses. Other courses may be taken with prior consent of Department.
(3) Credit in SCI 100 will be considered equivalent to MATH 114, 115, PHYS 144 and 146 and ★6 Science options.

Year 1

MATH 144 (or 117), 146 (or 118), 125 (or 127), 225 (or 227)
PHYS 144, 146
★6 in Science options (recommended options are ASTRO 120 and 122)
★6 in Arts options

Year 2

ASTRO 320
MATH 214 (or 217), 215 (or 317)
PHYS 234, 244, 271, 281, 295, 297
★3 in Arts options

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

194.15.4 Specialization in Astrophysics

Continuation in the Specialization in Astrophysics program requires successful completion of at least ★24 with a minimum 2.3 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA on the last ★90 credited to the degree.

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.
(4) Credit in SCI 100 is considered equivalent to MATH 114, 115, PHYS 144, 146 and ★6 Science options

Year 1

MATH 144 (or 117), 146 (or 118), 125 (or 127), 225 (or 227)
PHYS 144, 146
★6 in Science options (recommended options are ASTRO 120 and 122)
★6 in Arts options

Year 2

ASTRO 320
MATH 214 (or 217), 215 (or 317)
PHYS 234, 244, 271, 281, 295, 297
★3 in Arts options

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

194.15.5 Honors in Geophysics

Continuation in the Honors in Geophysics program requires successful completion of at least ★24 with a minimum 3.0 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA on the last ★90 credited to the degree.

Notes

(1) In addition to the specific courses listed in the program, students must take ★15 in approved Science options and ★12 in Arts options.
(2) Suggested approved Science options: ASTRO 429; EAS 221, 224, 320, 323, 324, 425; GEOPH 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 request permission 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 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.
(5) Credit in SCI 100 will be considered equivalent to CHEM 101, 102, EAS 105, MATH 114, 115, PHYS 144 and 146.

Year 1

CHEM 101, 102
GEOPH 110
MATH 144 (or 117), 146 (or 118), 125
PHYS 144, 146
★6 in Arts options (junior ENGL or junior WRS recommended)

Year 2

EAS 105
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 411), 334, 337
PHYS 381
★9 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)

194.15.6 Specialization in Geophysics

Continuation in the Specialization in Geophysics program requires successful completion of at least ★24 with a minimum 2.3 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 2.3 GPA on the last ★90 credited to the degree.

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, ★15 in approved Science options and ★12 in Arts options.
(2) **Specialization Pool A courses:** ASTRO 429; EAS 221, 320, 323, 324, 425; 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 request permission to register in those courses from the department offering the particular course. GEOPH courses are recommended.
(3) **Specialization Pool B courses:** EAS 224, 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 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.
(6) Credit in SCI 100 will be considered equivalent to CHEM 101, 102, EAS 105, MATH 114, 115, PHYS 144 and 146.

Year 1

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

Year 2

EAS 105
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
★15 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)

194.15.7 Honors in Mathematical Physics

Continuation in the Honors in Mathematical Physics program requires successful completion of at least ★24 with a minimum 3.0 GPA in the previous Fall/Winter. In addition, graduation requires a minimum 3.0 GPA on the last ★90 credited to the degree.

Notes

(1) MPH Senior Science options: any 300- or 400-level course offered by the Faculty of Science.
(2) MPH Pool courses: PHYS 362, 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.
(3) Credit in SCI 100 will be considered equivalent to MATH 114, 115, PHYS 144, 146 and ★6 Science options.

Year 1

MATH 117, 118, 125 or 127, 225 or 227
PHYS 144, 146
★6 in Science options
★6 in Arts options

Year 2

MATH 217, 317
MATH 334
PHYS 234, 244, 271, 281, 295
★6 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)

194.15.8 Science Internship Program

A Science Internship Program, is offered to students in the General, Specialization or Honors programs in Physics (see §192.11 for guidelines to the program). The Science Internship designation will appear on the degree parchments of students who have participated in the program and who have also successfully completed PHYS 400.

194.16 Physiology

194.16.1 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).

Continuation and graduation in the Honors Physiology program requires successful completion of ★30 with a minimum 3.3 GPA, in the previous Fall/Winter. In addition, second-year students must present a minimum grade of B in PHYSL 212 and PHYSL 214 in order to continue, whereas students who are eligible to enter the program in their third year and have credit in PHYSL 210 must present a minimum grade of A- in order to be admitted. Students must consult the Departmental Advisor prior to registration in each year of the program.

The course requirements for the program are as follows:

Year 1

BIOL 107
CHEM 101, 102, 164 (or 261), 263 (see Note 2)
STAT 141 or 151
★6 junior ENGL or ★3 junior ENGL and ★3 junior WRS
★6 in approved options

Year 2

BIOCH 200
BIOL 201, 207
PHYS 124, 126
PHYSL 212, 214
PMCOL 201, 202
★3 in approved options

Year 3

BIOCH 320, 330
PHYSL 310, 372, 401, 403
PMCOL 371
★6 in approved options

Year 4

PHYSL 467 and
★9 from PHYSL 400; 402; 404; 405; 444; 501; 513; PHYSL 545 or NEURO 443
★9 from BIOL 545; NEURO 410 or other 400- or 500-level Science or Non-Science or Non-Arts courses, with consent of the Department.
★6 in other approved options
OR
PHYSL 468 and 469 and ★12 from PHYSL 400, 402, 404, 405, 444, 501, 513; PHYSL 545 or BIOL 545; NEURO 410, 433; or other 400- or 500-level Science or non-Arts/non-Science courses, with consent of the Department
★6 in another approved options

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) Honors students in the first year of the program who are unable to take CHEM 263 may take 263 in second year.
(3) All options must be approved by Departmental Advisor.
(4) Credit in SCI 100 will be considered equivalent to BIOL 107, 108, CHEM 101, 102, 164, PHYS 144, 146 and ★6 approved Science options.

194.17 Psychology

194.17.1 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 after completion of a minimum of ★48. Final acceptance into the Honors program is dependent upon obtaining approval from a potential research supervisor prior to August 31.

Continuation in and graduation from the Honors Psychology program require successful completion of ★24 with a minimum GPA of 3.3 in each Fall/Winter Term. Exceptions to this requirement must be approved by both the Department of Psychology and the Faculty of Science. In addition, students must present a minimum of ★48 (but no more than ★66 senior) in Psychology courses and a minimum of ★72 in Science courses. A student's program of courses must be approved in advance each year by the Honors Psychology advisor.

Year 1

BIOL 107, 108
★6 junior ENGL or ★3 junior ENGL and WRS
PSYCO 104 or SCI 100; PSYCO 105
STAT 141 or 151
★3 from junior Mathematical Sciences
★3-6 in approved Science options

Year 2

STAT 252 and PSYCO 212 (PSYCO 212 must be completed by the end of the first term after admittance into the program)
★6 (two of) from PSYCO 223, 239, 241
★6 (two of) from PSYCO 258, 275, 282
★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 (PSYCO 212 must be completed by the end of the first term after admittance into the program)
★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) 400-level substantive content (non-methods) Psychology course 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.
(3) Credit in SCI 100 will be considered equivalent to BIOL 107, 108, CMPUT 174, PSYCO 104, MATH 114, 115 and ★9 approved Science options.

194.17.2 Specialization in Psychology

Continuation in the Specialization in Psychology program requires the successful completion of ★24 with 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 junior ENGL or ★3 junior ENGL and WRS
★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, 239, 241
★6 from PSYCO 258, 275, 282
★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

Notes

(1) 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 §193.2).
(2) Credit in SCI 100 will be considered equivalent to BIOL 107, 108, CHEM 101, CMPUT 174, MATH 114, PHYS 144, PSYCO 104 and ★6 Approved options.

194.17.3 Science Internship Program

A Science Industrial Internship Program, similar to a co-op program, is offered to students in the General, Specialization or Honors programs in Psychology (see §192.11 for guidelines to the program). The Science Internship designation will appear on the degree parchments of students who have participated in the program and who have also successfully completed PSYCO 410.

195 Details of Courses

195.1 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 (taught by the Faculty of Medicine and Dentistry) (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)
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)
Science (SCI)
Sciences de la Terre et de l'atmosphére (SCTA) (Faculté Saint-Jean)
Statistics (STAT)
Statistique (STATQ) (Faculté Saint-Jean)

195.2 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.)

195.3 Course Exceptions

195.3.1 Biochemistry Courses

All BIOCH courses can be used by students in the Faculty of Science as science courses.

195.3.2 Cell Biology Courses

All CELL courses can be used by students in the Faculty of Science as science courses.

195.3.3 Food Science Courses

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

195.3.4 Human Geography/Planning Courses

HGP 470 may be used by students in the Faculty of Science as a science course.

195.3.5 Medical Microbiology Courses

All MMI courses, with the exception of MMI 133, may be used by students in the Faculty of Science as science courses.

195.3.6 Neuroscience Courses

All NEURO courses may be used by students in the Faculty of Science as science courses.

195.3.7 Pharmacology Courses

All PMCOL courses, with the exception of PMCOL 300, may be used by students in the Faculty of Science as science courses.

195.3.8 Physiology Courses

All PHYSL courses, with the exception of PHYSL 600, may be used by students in the Faculty of Science as science courses.

195.4 Graduate Courses

Courses numbered 500 and up are restricted to graduate students and normally may not be taken for credit by undergraduate science students without prior written permission by the Associate Dean, Undergraduate or designate.

196 Certificates

The Faculty of Science offers certificates to graduating students which formally acknowledge that students have studied particular themes. These themes can be concentrations within a discipline, or subjects that cross interdisciplinary boundaries.

Normally the requirements for the certificates can be completed as part of the requirements for the degree; however, in some cases, a student may need to take more than the minimum required for his or her degree program in order to qualify for both the degree and the certificate. The following certificates are available:

Certificate in Computer Game Development:

The Certificate in Computer Game Development is a joint certificate offered by the Faculties of Arts and Science and is open to any undergraduate student at the University of Alberta. The certificate complements discipline-specific studies with courses that provide opportunities to work in multidisciplinary teams, build complete small and medium-scale games, and interact with industry.

Details of the courses and other requirements for the certificate can be found in §44.16.1 of the University Calendar in the Faculty of Arts Programs.

196.1 Research Certificate in Science

A Research Certificate in Science will provide an opportunity for undergraduate students to engage in authentic research in their discipline and acquire skills beyond what a normal research experience in an Honors or Specialization program may allow.

196.1.1 Research Certificate in Science (Biological Sciences)

A Research Certificate in Science (Biological Sciences) will provide an opportunity for undergraduate students to engage in authentic and focused research.

This certificate is open to undergraduate students in the Faculty of Science with preference given to BSc Honors and Specialization students in the Department of Biological Sciences and BSc General students (Biological Sciences major). Consent of the Department of Biological Sciences is required. Normally, a student will be able to fulfill the requirements for this certificate as part of a BSc program; some students may need to complete more than the minimum number of credits required in order to qualify for both the degree and the certificate.

Students wishing to pursue the Research Certificate in Science (Biological Sciences) must apply through Student Services Office (BS CW-312) for acceptance into BIOL 298. Application for this course does not guarantee a position in this program or the awarding of a certificate.

Students may pursue the Research Certificate in Science (Biological Sciences) by fulfilling the existing requirements for their program and by completing ★21 as follows:

(1) BIOL 298 (★3)

(2) BIOL 399 (★6) or BIOL 398 (★3) and BIOL 498 (★3)

(3) BIOL 499 (★6)

(4) ★3 from a list of 300- and 400-level approved options in data handling courses in Biological Sciences

(5) ★3 from a list of 300- and 400-level approved options in practical skills and techniques courses in Biological Sciences

(6) Presentation at a conference either on or off campus

Students wishing to receive the Research Certificate in Science (Biological Sciences) must apply through Undergraduate Student Services in the Faculty of Science by the application deadline for convocation (see §11).