Biotechnology

This section presents the requirements for programs in:
- Biochemistry and Biotechnology B.Sc. Honours
- Biology and Biotechnology B.Sc. Honours

Program Requirements

Biochemistry and Biotechnology
B.Sc. Honours (20.0 credits)

A. Credits Included in the Major CGPA (15.0 credits)

1. 4.0 credits in:
   - BIOL 1103 [0.5] Foundations of Biology I
   - BIOL 1104 [0.5] Foundations of Biology II
   - BIOL 2104 [0.5] Introductory Genetics
   - BIOL 2301 [0.5] Biotechnology I
   - BIOL 2303 [0.5] Microbiology
   - BIOL 3104 [0.5] Molecular Genetics
   - BIOL 3301 [0.5] Biotechnology II
   - BIOL 4301 [0.5] Current Topics in Biotechnology

2. 0.5 credit from:
   - BIOL 2001 [0.5] Animals: Form and Function
   - BIOL 2002 [0.5] Plants: Form and Function

3. 0.5 credit from:
   - BIOL 3201 [0.5] Cell Biology
   - BIOL 3205 [0.5] Plant Biochemistry and Physiology
   - BIOL 3303 [0.5] Experimental Microbiology
   - BIOL 3305 [0.5] Human and Comparative Physiology
   - BIOL 4109 [0.5] Laboratory Techniques in Molecular Genetics

4. 0.5 credit from:
   - BIOL 3201 [0.5] Cell Biology
   - BIOL 3303 [0.5] Experimental Microbiology
   - BIOL 4106 [0.5] Advances in Molecular Biology
   - BIOL 4109 [0.5] Laboratory Techniques in Molecular Genetics
   - BIOL 4201 [0.5] Advanced Cell Culture and Tissue Engineering
   - BIOL 4300 [0.5] Applied Microbiology
   - BIOL 4303 [0.5] Advances in Microbiology

5. 3.0 credits in:
   - BIOC 2200 [0.5] Cellular Biochemistry
   - BIOC 3101 [0.5] General Biochemistry I
   - BIOC 3102 [0.5] General Biochemistry II
   - BIOC 3103 [0.5] Practical Biochemistry I
   - BIOC 3104 [0.5] Practical Biochemistry II
   - BIOC 3202 [0.5] Biophysical Techniques and Applications

6. 1.0 credit from:
   - BIOC 4907 [1.0] Honours Essay and Research Proposal
   - BIOC 4908 [1.0] Research Project

7. 1.0 credit from:
   - BIOC 3008 [0.5] Bioinformatics
   - or BIOC 3203 [0.5] Biochemical Pharmacology
   - BIOC 4004 [0.5] Industrial Biochemistry

8. 4.0 credits in:
   - CHEM 1001 [0.5] General Chemistry I
   - CHEM 1002 [0.5] General Chemistry II
   - CHEM 2103 [0.5] Physical Chemistry I
   - or BIOC 2300 [0.5] Physical Biochemistry
   - CHEM 2203 [0.5] Organic Chemistry I
   - CHEM 2204 [0.5] Organic Chemistry II
   - CHEM 2303 [0.5] Analytical Chemistry II
   - CHEM 2501 [0.5] Introduction to Inorganic and Bioinorganic Chemistry
   - CHEM 3201 [0.5] Advanced Organic Chemistry I

9. 0.5 credit from:
   - BIOC courses listed in, but not used to fulfill Item 7 above
   - CHEM 3102 [0.5] Mycology
   - BIOC 3202 [0.5] Principles of Developmental Biology
   - BIOC 3306 [0.5] Human Anatomy and Physiology
   - BIOC 3307 [0.5] Advanced Human Anatomy and Physiology
   - BIOC 3501 [0.5] Biomechanics
   - BIOC 4104 [0.5] Evolutionary Genetics
   - BIOC 4206 [0.5] Human Genetics
   - BIOC 4207 [0.5] Advanced Embryology & Developmental Biology
   - BIOC 4209 [0.5] Advanced Plant Physiology
   - BIOC 4304 [0.5] Forensic Biology
   - BIOC 4309 [0.5] Studies in Human Performance
   - BIOC 4317 [0.5] Neuroethology: The Neural Basis of Animal Behaviour
   - BIOC 4319 [0.5] Studies in Exercise Physiology
   - BIOL courses listed in, but not used to fulfill Item 3 or 4
   - BIOL 2001 [0.5] Animals: Form and Function
   - BIOL 2002 [0.5] Plants: Form and Function
   - BIOL 3102 [0.5] Mycology
   - BIOC 3202 [0.5] Principles of Developmental Biology
   - BIOC 3306 [0.5] Human Anatomy and Physiology
   - BIOC 3307 [0.5] Advanced Human Anatomy and Physiology
   - BIOC 3501 [0.5] Biomechanics
   - BIOC 4104 [0.5] Evolutionary Genetics
   - BIOC 4206 [0.5] Human Genetics
   - BIOC 4207 [0.5] Advanced Embryology & Developmental Biology
   - BIOC 4209 [0.5] Advanced Plant Physiology
   - BIOC 4304 [0.5] Forensic Biology
   - BIOC 4309 [0.5] Studies in Human Performance
   - BIOC 4317 [0.5] Neuroethology: The Neural Basis of Animal Behaviour
   - BIOC 4319 [0.5] Studies in Exercise Physiology
   - BIOL courses listed in, but not used to fulfill Item 4 above
   - CHEM 3100 [0.5] Physical Chemistry II
   - CHEM 3107 [0.5] Experimental Methods in Nanoscience
   - CHEM 3202 [0.5] Advanced Organic Chemistry II
   - CHEM 3205 [0.5] Experimental Organic Chemistry
   - CHEM 3600 [0.5] Introduction to Nanotechnology
   - CHEM 3700 [0.5] Industrial Applications of Chemistry

2021-2022 Carleton University Undergraduate Calendar
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 3800 [0.5]</td>
<td>The Chemistry of Environmental Pollutants</td>
<td></td>
</tr>
<tr>
<td>CHEM 4201 [0.5]</td>
<td>Macromolecular Nanotechnology</td>
<td></td>
</tr>
<tr>
<td>CHEM 4406 [0.5]</td>
<td>Pharmaceutical Drug Design</td>
<td></td>
</tr>
</tbody>
</table>

**B. Credits Not Included in the Major CGPA (5.0 credits)**

10. **1.0 credit from:**
- PHYS 1007 [0.5] Elementary University Physics I
- PHYS 1008 [0.5] Elementary University Physics II

11. **1.5 credits in:**
- MATH 1007 [0.5] Elementary Calculus I
- MATH 1107 [0.5] Linear Algebra I
- STAT 2507 [0.5] Introduction to Statistical Modeling I

12. **2.0 credits in** Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)

13. **0.5 credit in** free elective.

**Total Credits** 20.0

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**Biology and Biotechnology B.Sc. Honours (20.0 credits)**

**A. Credits Included in the Major CGPA (13 credits)**

1. **6.5 credits in:**
- BIOL 1103 [0.5] Foundations of Biology I
- BIOL 1104 [0.5] Foundations of Biology II
- BIOL 1105 [0.5] Biological Methods, Analysis and Interpretation
- BIOL 2001 [0.5] Animals: Form and Function
- BIOL 2002 [0.5] Plants: Form and Function
- BIOL 2104 [0.5] Introductory Genetics
- BIOL 2200 [0.5] Cellular Biochemistry
- BIOL 2301 [0.5] Biotechnology I
- BIOL 2303 [0.5] Microbiology
- BIOL 3104 [0.5] Molecular Genetics
- BIOL 3201 [0.5] Cell Biology
- BIOL 3301 [0.5] Biotechnology II
- BIOL 4301 [0.5] Current Topics in Biotechnology

2. **1.5 credit in:**
- BUSI 2800 [0.5] Entrepreneurship
- BIOC 3101 [0.5] General Biochemistry I
- BIOC 3102 [0.5] General Biochemistry II

3. **4.0 credits from:**
- BIOC 2300 [0.5] Physical Biochemistry
- BIOC 3103 [0.5] Practical Biochemistry I
- BIOC 3104 [0.5] Practical Biochemistry II
- BIOC 3202 [0.5] Biophysical Techniques and Applications
- BIOC 3304 [0.5] Insect Diversity
- BIOC 3305 [0.5] Mycology
- BIOC 3306 [0.5] Plant Biochemistry and Physiology
- BIOC 3307 [0.5] Experimental Microbiology

4. **1.0 credit in:**
- BIOL 4901 [1.0] Honours Workshop
- or BIOL 4907 [1.0] Honours Essay and Research Proposal
- or BIOL 4908 [1.0] Honours Research Thesis

**B. Credits Not Included in the Major CGPA (7.0 credits)**

5. **2.0 credits in:**
- CHEM 1001 [0.5] General Chemistry I & CHEM 1002 [0.5] General Chemistry II
- CHEM 2203 [0.5] Organic Chemistry I & CHEM 2204 [0.5] Organic Chemistry II (See Note, below)

6. **0.5 credit in:**
- MATH 1007 [0.5] Elementary Calculus I

7. **1.5 credits from:**
- COMP 1005 [0.5] Introduction to Computer Science I
- COMP 1006 [0.5] Introduction to Computer Science II
- MATH 1107 [0.5] Linear Algebra I

8. **2.0 credits in** Approved Courses Outside the Faculties of Science and Engineering and Design (may include NSCI 1000)

9. **1.0 credit in** free electives.

**Total Credits** 20.0
B.Sc. Regulations

The regulations presented in this section apply to all Bachelor of Science programs. In addition to the requirements presented here, students must satisfy the University regulations common to all undergraduate students including the process of Academic Performance Evaluation (see the Academic Regulations of the University section of this Calendar).

Breadth Requirement for the B.Sc.

Students in a Bachelor of Science program must present the following credits at graduation:

1. 2.0 credits in Science Continuation courses not in the major discipline; students completing a double major are considered to have completed this requirement providing they have 2.0 credits in science continuation courses in each of the two majors
2. 2.0 credits in courses outside of the faculties of Science and Engineering and Design (but may include NSCI 1000)

In most cases, the requirements for individual B.Sc. programs, as stated in this Calendar, contain these requirements, explicitly or implicitly.

Students admitted to B.Sc. programs by transfer from another institution must present at graduation (whether taken at Carleton or elsewhere):

1. 2.0 credits in courses outside of the faculties of Science and Engineering and Design (but may include NSCI 1000) if, on transfer, the student received credit for fewer than 10.0 credits.
2. 1.0 credit in courses outside of the faculties of Science and Engineering and Design (but may include NSCI 1000) if, on transfer, the student received credit for 10.0 or more credits.

Declared and Undeclared Students

Students who are registered in a program within the degree are called Declared students. Most students designate a program of study when they first apply for admission and so begin their studies as Declared students. Students may also choose to begin their studies within the B.Sc. degree without being registered in a program. These students are referred to as Undeclared students. The recommended course pattern for Undeclared students is provided in the Undeclared entry of the Programs section of this Calendar. Undeclared students normally must apply to enter a program before beginning their second year of study. The Science Student Success Centre (SSSC) provides Undeclared students guidance to the appropriate support services in making this decision.

Change of Program within the B.Sc. Degree

Students may transfer to a program within the B.Sc. degree if upon entry to the new program they would be in good academic standing.

Other applications for change of program will be considered on their merits; students may be accepted in the new program in Good Standing or on Academic Warning.

Applications to declare or change their program within the B.Sc. Degree must be made online through Carleton Central by completing a Change of Program Elements (COPE) application form within the published deadlines. Acceptance into a program or into a program element or option is subject to any enrolment, and/or specific program, program element or option requirements as published in the relevant Calendar entry.

Minors, Concentrations and Specializations

Students may add a minor, concentration or specialization by completing a Change of Program Elements (COPE) application form online through Carleton Central. Acceptance into a minor, concentration or specialization requires that the student be in Good Standing and is subject to any specific requirements of the intended Minor, Concentration or Specialization as published in the relevant Calendar entry.

Experimental Science Requirement

Students in a B.Sc. degree program must present at graduation at least two full credits of experimental science chosen from two different departments or institutes from the list below:

Approved Experimental Science Courses

<table>
<thead>
<tr>
<th>Biochemistry</th>
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</thead>
<tbody>
<tr>
<td>BIOC 2200 [0.5]</td>
<td>Cellular Biochemistry</td>
</tr>
<tr>
<td>BIOC 4001 [0.5]</td>
<td>Methods in Biochemistry</td>
</tr>
<tr>
<td>BIOC 4201 [0.5]</td>
<td>Advanced Cell Culture and Tissue Engineering</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Biology</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 1103 [0.5]</td>
<td>Foundations of Biology I</td>
</tr>
<tr>
<td>BIOL 1104 [0.5]</td>
<td>Foundations of Biology II</td>
</tr>
<tr>
<td>BIOL 2001 [0.5]</td>
<td>Animals: Form and Function</td>
</tr>
<tr>
<td>BIOL 2002 [0.5]</td>
<td>Plants: Form and Function</td>
</tr>
<tr>
<td>BIOL 2104 [0.5]</td>
<td>Introductory Genetics</td>
</tr>
<tr>
<td>BIOL 2200 [0.5]</td>
<td>Cellular Biochemistry</td>
</tr>
<tr>
<td>BIOL 2600 [0.5]</td>
<td>Ecology</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemistry</th>
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</thead>
<tbody>
<tr>
<td>CHEM 1001 [0.5]</td>
<td>General Chemistry I</td>
</tr>
<tr>
<td>CHEM 1002 [0.5]</td>
<td>General Chemistry II</td>
</tr>
<tr>
<td>CHEM 1005 [0.5]</td>
<td>Elementary Chemistry I</td>
</tr>
<tr>
<td>CHEM 1006 [0.5]</td>
<td>Elementary Chemistry II</td>
</tr>
<tr>
<td>CHEM 2103 [0.5]</td>
<td>Physical Chemistry I</td>
</tr>
<tr>
<td>CHEM 2203 [0.5]</td>
<td>Organic Chemistry I</td>
</tr>
<tr>
<td>CHEM 2204 [0.5]</td>
<td>Organic Chemistry II</td>
</tr>
<tr>
<td>CHEM 2302 [0.5]</td>
<td>Analytical Chemistry I</td>
</tr>
<tr>
<td>CHEM 2303 [0.5]</td>
<td>Analytical Chemistry II</td>
</tr>
<tr>
<td>CHEM 2800 [0.5]</td>
<td>Foundations for Environmental Chemistry</td>
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</table>

<table>
<thead>
<tr>
<th>Earth Sciences</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ERTH 1006 [0.5]</td>
<td>Exploring Planet Earth</td>
</tr>
<tr>
<td>ERTH 1009 [0.5]</td>
<td>The Earth System Through Time</td>
</tr>
<tr>
<td>ERTH 2102 [0.5]</td>
<td>Mineralogy to Petrology</td>
</tr>
<tr>
<td>ERTH 2404 [0.5]</td>
<td>Engineering Geoscience</td>
</tr>
<tr>
<td>ERTH 2802 [0.5]</td>
<td>Field Geology I</td>
</tr>
</tbody>
</table>
Course Categories for B.Sc. Programs

Science Geography Courses
- GEOG 1010 [0.5] Global Environmental Systems
- GEOG 2006 [0.5] Introduction to Quantitative Research
- GEOG 2013 [0.5] Weather and Water
- GEOG 2014 [0.5] The Earth's Surface
- GEOG 3003 [0.5] Quantitative Geography
- GEOG 3010 [0.5] Field Methods in Physical Geography
- GEOG 3102 [0.5] Geomorphology
- GEOG 3103 [0.5] Watershed Hydrology
- GEOG 3104 [0.5] Principles of Biogeography
- GEOG 3105 [0.5] Climate and Atmospheric Change
- GEOG 3106 [0.5] Aquatic Science and Management
- GEOG 3108 [0.5] Soil Properties
- GEOG 4000 [0.5] Field Studies
- GEOG 4005 [0.5] Directed Studies in Geography
- GEOG 4013 [0.5] Cold Region Hydrology
- GEOG 4017 [0.5] Global Biogeochemical Cycles
- GEOG 4101 [0.5] Two Million Years of Environmental Change
- GEOG 4103 [0.5] Water Resources Engineering
- GEOG 4104 [0.5] Microclimatology
- GEOG 4108 [0.5] Permafrost

Science Psychology Courses
- PSYC 2001 [0.5] Introduction to Research Methods in Psychology
- PSYC 2002 [0.5] Introduction to Statistics in Psychology
- PSYC 2700 [0.5] Introduction to Cognitive Psychology
- PSYC 3000 [1.0] Design and Analysis in Psychological Research
- PSYC 3506 [0.5] Cognitive Development
- PSYC 3700 [1.0] Cognition (Honours Seminar)
- PSYC 3702 [0.5] Perception
- PSYC 2307 [0.5] Human Neuropsychology I
- PSYC 3307 [0.5] Human Neuropsychology II

Science Continuation Courses
A course at the 2000 level or above may be used as a Science Continuation credit in a B.Sc. program if it is not in the student's major discipline, and is chosen from the following:
- BIOC (Biochemistry)
- BIOL (Biology)
- CHEM (Chemistry)
- COMP (Computer Science) A maximum of two half-credits at the 1000-level in COMP, excluding COMP 1001 may be used as Science Continuation credits.
- ERTH (Earth Sciences), except ERTH 2415 which may be used only as a free elective for any B.Sc. program. Students in Earth Sciences programs may use ERTH 2401, ERTH 2402, and ERTH 2403 only as free electives.

Engineering. Students wishing to register in Engineering courses must obtain the permission of the Faculty of Engineering and Design.
- ENSC (Environmental Science)
- FOOD (Food Science and Nutrition)
- GEOM (Geomatics)
- HLTH (Health Sciences)
- ISAP (Interdisciplinary Science Practice)
- MATH (Mathematics)
- NEUR (Neuroscience)
- PHYS (Physics), except PHYS 2903

Science Geography Courses (see list above)
Science Psychology Courses (see list above)
Science Psychology Courses (see list above)
STAT (Statistics)

TSES (Technology, Society, Environment) except TSES 2305. Biology students may use these courses only as free electives. Integrated Science and Environmental Science students may include these courses in their programs but may not count them as part of the Science Sequence.

Science Faculty Electives
Science Faculty Electives are courses at the 1000-4000 level chosen from:
- BIOC (Biochemistry)
- BIOL (Biology) Biology & Biochemistry students may use BIOL 1010 and BIOL 2005 only as free electives
Free Electives

and Engineering and Design (may include
the 2000-4000 level chosen from the Science Faculty
Advanced Science Faculty Electives are courses at
Advanced Science Faculty Electives
PHYS 1902
PHYS 1901
MATH 0107
ISCI 2002
ISCI 2000
ISCI 1001
ERTH 2415
ERTH 1011
ERTH 1010
CHEM 1007
CHEM 1004
CHEM 1003
BIOL 4810
Courses Allowable Only as Free Electives in any
restrictions for all courses as published in this Calendar.
comply with prerequisite requirements and enrolment
is not prohibited (see below). Students are expected to
Engineering
ENSC 2001
FOOD (Food Science and Nutrition)
GEOM (Geomatics)
HLTH (Health Science)
ISAP (Interdisciplinary Science Practice)
MATH (Mathematics)
NEUR (Neuroscience)
PHYS (Physics) except PHYS 1901, PHYS 1902,
PHYS 1905, PHYS 2903
Science Geography (see list above)
Science Psychology (see list above)
STAT (Statistics)
TSES (Technology, Society, Environment) Biology
Advanced Science Faculty Electives
Advanced Science Faculty Electives are courses at
the 2000-4000 level chosen from the Science Faculty
Electives list above.
Approved Courses Outside the Faculties of Science
and Engineering and Design (may include NSCI 1000)
All courses offered by the Faculty of Arts and Social
Sciences, the Faculty of Public Affairs, and the
Sprott School of Business are approved as Arts or
Social Sciences courses EXCEPT FOR: All Science
Geography courses (see list above), all Geomatics
(GEOM) courses, all Science Psychology courses
(see list above), NSCI 1000 may be used as an
Approved Course Outside the Faculties of Science and
Engineering and Design.
Free Electives
Any course is allowable as a Free Elective providing it is
not prohibited (see below). Students are expected to
comply with prerequisite requirements and enrolment
restrictions for all courses as published in this Calendar.
Courses Allowable Only as Free Electives in any
B.Sc. Program
BIOL 4810 [0.5] Education Research in Biology
CHEM 1003 [0.5] The Chemistry of Food, Health and Drugs
CHEM 1004 [0.5] Drugs and the Human Body
CHEM 1007 [0.5] Chemistry of Art and Artifacts
ERTH 1010 [0.5] Our Dynamic Planet Earth
ERTH 1011 [0.5] Evolution of the Earth
ERTH 2415 [0.5] Natural Disasters
ISCI 1001 [0.5] Introduction to the Environment
ISCI 2000 [0.5] Natural Laws
ISCI 2002 [0.5] Human Impacts on the Environment
MATH 0107 [0.5] Algebra and Geometry
PHYS 1901 [0.5] Planetary Astronomy
PHYS 1902 [0.5] From our Star to the Cosmos
PHYS 1905 [0.5] Physics Behind Everyday Life
PHYS 2903 [0.5] Physics Towards the Future
Prohibited Courses
The following courses are not acceptable for credit in any
B.Sc. program:
COMP 1001 [0.5] Introduction to Computational
Thinking for Arts and Social Science Students
MATH 0005 [0.5] Precalculus: Functions and Graphs
MATH 0006 [0.5] Precalculus: Trigonometric
Functions and Complex Numbers
MATH 1009 [0.5] Mathematics for Business
MATH 1119 [0.5] Linear Algebra: with Applications to Business
MATH 1401 [0.5] Elementary Mathematics for Economics I
MATH 1402 [0.5] Elementary Mathematics for Economics II
Co-operative Education
For more information about how to apply for the Co-op
program and how the Co-op program works please visit
the Co-op website.
All students participating in the Co-op program are
governed by the Undergraduate Co-operative Education
Policy.
Undergraduate Co-operative Education Policy
Admission Requirements
Students can apply to co-op in one of two ways; directly
from high school or after beginning a degree program at
Carleton.
If a student is admitted to co-op from high school, their
grades will be reviewed two terms to one year prior to
their first work term to ensure they continue to meet the
academic requirements after their 1st or 2nd year of study.
The time at which evaluation takes place depends on the
program of study. Students will automatically be notified
via their Carleton email account if they are permitted to
continue.
Students not admitted to Carleton University with the co-
option on their degree can apply for admission via
the co-operative education program website. To view
application deadlines, visit carleton.ca/co-op.
Admission to the co-op option is based on the completion
of 5.0 or more credits at Carleton University, the CGPA
requirement for the students' academic program as well
as any course prerequisites. The articulated CGPA for
each program is the normal standard for assessment.
Please see the specific degree program sections for the
unique admission and continuation requirements for each
academic program.
Participation Requirements
COOP 1000
Once a student has been given admission or continuation
confirmation to the co-op option s/he must complete and
pass COOP 1000 (a mandatory online 0.0 credit course).
Students will have access to this course a minimum of two
Communication with the Co-op Office
Students must maintain contact with the co-op office during their job search and while on a work term. All email communication will be conducted via the students’ Carleton email account.

Employment
Although every effort is made to ensure a sufficient number of job postings for all students enrolled in the co-op option of their degree program, no guarantee of employment can be made. Carleton’s co-op program operates a competitive job search process and is dependent upon current market conditions. Academic performance, skills, motivation, maturity, attitude and potential will determine whether a student is offered a job. It is the student’s responsibility to actively conduct a job search in addition to participation in the job search process operated by the co-op office. Once a student accepts a co-op job offer (verbally or written), his/her job search will end and access to co-op jobs will be removed for that term. Students that do not successfully obtain a co-op work term are expected to continue with their academic studies. The summer term is the exception to this rule. Students should also note that hiring priority is given to Canadian citizens for co-op positions in the Federal Government of Canada.

Registering in Co-op Courses
Students will be registered in a Co-op Work Term course while at work. The number of Co-op Work Term courses that a student is registered in is dependent upon the number of four-month work terms that a student accepts.

While on a co-op work term students may take a maximum of 0.5 credit throughout each four-month co-op work term. Courses must be scheduled outside of regular working hours.

Students must be registered as full-time before they begin their co-op job search (2.0 credits). All co-op work terms must be completed before the beginning of the final academic term. Students may not finish their degree on a co-op work term.

Work Term Assessment and Evaluation
To obtain a Satisfactory grade for the co-op work term students must have:

1. A satisfactory work term evaluation by the co-op employer;
2. A satisfactory grade on the work term report.

Students must submit a work term report at the completion of each four-month work term. Reports are due on the 16th of April, August, and December and students are notified of due dates through their Carleton email account.

Workplace performance will be assessed by the workplace supervisor. Should a student receive an unsatisfactory rating from their co-op employer, an investigation by the co-op program manager will be undertaken. An unsatisfactory employer evaluation does not preclude a student from achieving an overall satisfactory rating for the work term.

Graduation with the Co-op Designation
In order to graduate with the co-op designation, students must satisfy all requirements for their degree program in addition to the requirements according to each co-op program (i.e. successful completion of three or four work terms).

Note: Participation in the co-op option will add up to one additional year for a student to complete their degree program.

Voluntary Withdrawal from the Co-op Option
Students may withdraw from the co-op option of their degree program during a study term ONLY. Students at work may not withdraw from the work term or the co-op option until s/he has completed the requirements of the work term.

Students are eligible to continue in their regular academic program provided that they meet the academic standards required for continuation.

Involuntary or Required Withdrawal from the Co-op Option
Students may be required to withdraw from the co-op option of their degree program for one or any of the following reasons:

1. Failure to achieve a grade of SAT in COOP 1000
2. Failure to pay all co-op related fees
3. Failure to actively participate in the job search process
4. Failure to attend all interviews for positions to which the student has applied
5. Declining more than one job offer during the job search process
6. Continuing a job search after accepting a co-op position
7. Dismissal from a work term by the co-op employer
8. Leaving a work term without approval by the Co-op manager
9. Receipt of an unsatisfactory work term evaluation
10. Submission of an unsatisfactory work term report

Standing and Appeals
The Co-op and Career Services office administers the regulations and procedures that are applicable to all co-op program options. All instances of a student’s failure during a work term or other issues directly related to their participation in the co-op option will be reported to the academic department.

Any decision made by the Co-op and Career Services office can be appealed via the normal appeal process within the University.

International Students
All International Students are required to possess a Co-op Work Permit issued by Immigration, Refugees and Citizenship Canada before they can begin working. It is illegal to work in Canada without the proper authorization. Students will be provided with a letter of support to

6  Biotechnology
accompany their application. Students must submit their application for their permit before being permitted to view and apply for jobs on the Co-op Services database. Confirmation of a position will not be approved until a student can confirm they have received their permit. Students are advised to discuss the application process and requirements with the International Student Services Office.

**B.Sc. Honours Biotechnology: Co-op Admission and Continuation Requirements**

- Maintain full-time status in each study term (2.0 credits);
- Be eligible to work in Canada (for off-campus work);
- Have successfully completed COOP 1000 [0.0]

**Co-operative Education - Bachelor of Science**
The following programs in the Bachelor of Science Honours offer a co-operative education option:

- Applied Physics, Biochemistry (including computational), Bioinformatics, Biology (including computational), Biotechnology, Chemistry (including computational), Earth Sciences, Environmental Science, Food Science and Nutrition, Geomatics, Neuroscience, Neuroscience and Mental Health, Physical Geography and Physics.

Students in all streams of the Bachelor of Science must successfully complete three (3) work terms to obtain the co-op designation.

**Co-op Admission and Continuation Requirements for Students in the Bachelor of Science**

For admission to and continuation in the co-op option, all students must:

- Maintain full-time status in each study term (2.0 credits);
- Be eligible to work in Canada (for off-campus work);
- Have successfully completed COOP 1000

**Program-Specific Admission and Continuation Requirements:**

- Applied Physics, Biochemistry (including computational), Bioinformatics, Biology (including computational), Biotechnology, Chemistry (including computational), Earth Sciences, Environmental Science, Neuroscience, Neuroscience and Mental Health and Physics:
  
1. Completion of 5.0 or more credits at Carleton University;
2. Registered as a full-time student in the Bachelor of Science Honours degree program;
3. Obtained and maintained a major CGPA of 8.0 or higher and an overall CGPA of 6.50 or higher

**Food Science and Nutrition**

1. Registered as a full-time student in the Bachelor of Science Honours in Food Science and Nutrition;
2. Obtained and maintained a major CGPA of 9.0 or higher and an overall CGPA of 7.5 or higher in the first three years of academic study
3. Have obtained third-year standing;
4. Successfully completed, by the start date of the first work term, at least 2.0 credits from the following list of courses: FOOD 3001, FOOD 3002, FOOD 3003, FOOD 3004, and FOOD 3005

**Geomatics and Physical Geography:**

1. Registered in the Bachelor of Science (Honours) Programs in Physical Geography or Geomatics;
2. Obtained and maintained an overall minimum CGPA of 9.5 and a major CGPA of 9.5;
3. Have obtained third-year standing;
4. Successfully completed, by the start-date of the first work term:
   - a. the required second-year methods courses in their program (GEOG/ENST 2005, GEOG/ENST 2006)
   - b. the required field course in their program (ENST 3900/GEOG 3000/GEOG 3010/GEOG 3030)
5. Be registered as a full-time student.

**Co-op Work Term Courses**

<table>
<thead>
<tr>
<th>Program</th>
<th>Course Code</th>
<th>Work Term Report</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physics, Applied Physics, Biology and Physics</strong></td>
<td>PHYS 3999</td>
<td>Co-operative Work Term Report</td>
</tr>
<tr>
<td><strong>Chemistry and Physics, Mathematics and Physics</strong></td>
<td>BIOC 3999</td>
<td>Co-operative Work Term</td>
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<tr>
<td><strong>Biochemistry and Computational Biochemistry</strong></td>
<td>BIOC 3999</td>
<td>Co-operative Work Term</td>
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<td><strong>Biochemistry and Biotechnology, Bioinformatics</strong></td>
<td>BIOI 3999</td>
<td>Co-operative Work Term</td>
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<td><strong>Biochemistry and Biotechnology, Biology, Biotechnology, Computational Biology</strong></td>
<td>BIOI 3999</td>
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<tr>
<td><strong>Biochemistry and Biotechnology, Biology, Computational Biology, Biology and Physics</strong></td>
<td>BIOI 3999</td>
<td>Co-operative Work Term</td>
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<tr>
<td><strong>Chemistry, Chemistry and Physics, Computational Chemistry</strong></td>
<td>CHEM 3999</td>
<td>Co-operative Work Term</td>
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<tr>
<td><strong>Earth Sciences</strong></td>
<td>ERTH 3999</td>
<td>Co-operative Work Term</td>
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<tr>
<td><strong>Food Science</strong></td>
<td>FOOD 3999</td>
<td>Co-operative Work Term</td>
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<tr>
<td><strong>Environmental Science</strong></td>
<td>ENSC 3999</td>
<td>Co-operative Work Term</td>
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<tr>
<td><strong>Geomatics</strong></td>
<td>GEOM 3999</td>
<td>Co-operative Work Term</td>
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<tr>
<td><strong>Neuroscience and Neuroscience Mental Health</strong></td>
<td>NEUR 3999</td>
<td>Co-operative Work Term</td>
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<tr>
<td><strong>Physical Geography</strong></td>
<td>GEOG 3999</td>
<td>Co-operative Work Term</td>
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</tbody>
</table>

**Work-Study Patterns**

<table>
<thead>
<tr>
<th>Program</th>
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<tbody>
<tr>
<td><strong>Applied Physics, Biochemistry, Bioinformatics, Biology, Biotechnology, Chemistry, Computational Biochemistry, Computational Biology, Computational Chemistry, Earth Sciences, Environmental Science, Neuroscience, Neuroscience and Mental Health, Physics</strong></td>
</tr>
</tbody>
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2021-2022 Carleton University Undergraduate Calendar
**Food Science and Nutrition**

<table>
<thead>
<tr>
<th>Year 1</th>
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<th>Year 3</th>
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**Physical Geography, Geomatics**

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<th>Year 1</th>
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**Legend**
- S: Study
- W: Work
- O: Optional

* indicates recommended work study pattern
** indicates student finds own employer for this work-term.

**Admissions Information**

Admission Requirements are for the 2021-22 year only, and are based on the Ontario High School System. Holding the minimum admission requirements only establishes eligibility for consideration. The cut-off averages for admission may be considerably higher than the minimum. See also the [General Admission and Procedures section of this Calendar](#) for admission to programs which the demand for places by qualified applicants exceeds the number of places available. The overall average required for admission is determined each year on a program basis. Consult [admissions.carleton.ca](http://admissions.carleton.ca) for further details.

Note: Courses listed as recommended are not mandatory for admission. Students who do not follow the recommendations will not be disadvantaged in the admission process.

**Degrees**

- B.Sc. (Honours)
- B.Sc. (Major)
- B.Sc.

**Admission Requirements**

**B. Sc. Honours Program**

**First Year**

The Ontario Secondary School Diploma (OSSD) or equivalent including a minimum of six 4U or M courses. For most programs including Biochemistry, Bioinformatics, Biotechnology, Chemistry, Combined Honours in Biology and Physics, Chemistry and Physics, Computational Biochemistry, Food Science, Nanoscience, Neuroscience, Neuroscience and Mental Health, and Psychology, the six 4U or M courses must include Advanced Functions and two of Biology, Chemistry, Earth and Space Sciences or Physics. (Calculus and Vectors is strongly recommended).

**Specific Honours Admission Requirements**

For the Honours programs in Earth Sciences, Environmental Science, Geomatics, Interdisciplinary Science and Practice, and Physical Geography, Calculus and Vectors may be substituted for Advanced Functions.

For the Honours programs in Physics and Applied Physics and for double Honours in Mathematics and Physics, Calculus and Vectors is required in addition to Advanced Functions and one of 4U Physics Chemistry, Biology, or Earth and Space Sciences. For all programs in Physics, 4U Physics is strongly recommended.

For the Combined Honours program in Chemistry and Computer Science, 4U Chemistry and Calculus and Vectors are strongly recommended.

For Honours in Psychology, a 4U course in English is recommended.

For Honours in Environmental Science, a 4U course in Biology and Chemistry is recommended.

**Advanced Standing**

For entry to an Honours program after the completion of 5.0 included credits, a student must have a major CGPA of 5.50 or higher, an overall CGPA of 4.50 or higher and the recommendation of the Honours department or committee. A student beginning the final 10.0 credits towards an Honours degree must present a major CGPA of 6.00 or higher, an overall CGPA of 5.00 or higher and the recommendation of the Honours department or committee. A student beginning the final 5.0 credits towards an Honours degree must present a major CGPA of 6.50 or higher and an overall CGPA of 5.00 or higher, as calculated for graduation. Advanced standing will be granted for studies undertaken elsewhere when these are recognized as the equivalent of subjects offered at Carleton University.

**B.Sc. Major Program**

**B.Sc. Program**

**First Year**

The Ontario Secondary School Diploma (OSSD) or equivalent including a minimum of six 4U or M courses. For most programs including Biochemistry, Bioinformatics, Biotechnology, Chemistry, Combined Honours in Biology and Physics, Chemistry and Physics, Computational Biochemistry, Food Science, Nanoscience, Neuroscience, Neuroscience and Mental Health, and Psychology, the six 4U or M courses must include Advanced Functions and two of Biology, Chemistry, Earth and Space Sciences or Physics. (Calculus and Vectors is strongly recommended).

**Advanced Standing**

For entry to a B.Sc. or B.Sc. Major program after the completion of 5.0 included credits, a student must have a major and core CGPA of 3.50 or higher and an overall CGPA of 3.50 or higher. A student beginning the final 5.0 credits towards a B.Sc. or B.Sc. Major degree must present a major and core CGPA of 4.00 or higher and an overall CGPA of 4.00 or higher, as calculated for graduation. Advanced standing will be granted for studies
undertaken elsewhere when these are recognized as the equivalent of subjects offered at Carleton University.

**Co-op Option**

**Direct Admission to the First Year of the Co-op Option**

Applicants must:

1. meet the required overall admission cut-off average and prerequisite course average. These averages may be higher than the stated minimum requirements;
2. be registered as a full-time student in the Bachelor of Science Honours program;
3. be eligible to work in Canada (for off-campus work placements).

Note that meeting the above requirements only establishes eligibility for admission to the program. The prevailing job market may limit enrolment in the co-op option.

Note: continuation requirements for students previously admitted to the co-op option and admission requirements for the co-op option after beginning the program are described in the Co-operative Education Regulations section of this Calendar.