

# Food Science

This section presents the requirements for programs in:

- **Food Science B.Sc. Honours**
- **Minor in Food Science**

## Food Science B.Sc. Honours (20.0 credits)

### A. Credits Included in the Major CGPA (9.0 credits)

#### 1. 6.0 credits in: 6.0

FOOD 1001 [0.5]	Introduction to Food Science
FOOD 2001 [0.5]	Principles of Nutrition
FOOD 2002 [0.5]	Food Processing
FOOD 2003 [0.5]	Regulation of the Canadian Food Industry
FOOD 2004 [0.5]	Scientific Writing in Food Science
FOOD 3001 [0.5]	Food Chemistry
FOOD 3002 [0.5]	Food Analysis
FOOD 3005 [0.5]	Food Microbiology
FOOD 4001 [0.5]	Food Quality Control
FOOD 4102 [0.5]	Current Issues in Canadian Food Governance, Regulation and Policy
FOOD 4103 [0.5]	Food Safety Risk Assessment, Communication and Management

#### 2. 1.5 credits from: 1.5

FOOD 3003 [0.5]	Food Packaging and Shelf Life
FOOD 3004 [0.5]	Food Engineering
FOOD 4002 [0.5]	Analysis of Food Contaminants
FOOD 4202 [0.5]	Micronutrients and Health
FOOD 4203 [0.5]	Functional Foods and Natural Health Products

#### 3. 0.5 credit from: 0.5

FOOD 4301 [0.5]	Food Toxicology
BIOC 4708 [0.5]	Principles of Toxicology

#### 4. 1.0 credit from: 1.0

FOOD 4905 [1.0]	Food Science Honours Workshop
FOOD 4907 [1.0]	Food Science Honours Essay and Research Proposal
FOOD 4908 [1.0]	Food Science Research Project

### B. Credits Not Included in the Major CGPA (11.0 credits)

#### 5. 0.5 credit from: 0.5

PHIL 1550 [0.5]	Introduction to Ethics and Social Issues
PHIL 2408 [0.5]	Bioethics

#### 6. 1.0 credit in: 1.0

ECON 1001 [0.5]	Introduction to Microeconomics
ECON 1002 [0.5]	Introduction to Macroeconomics

#### 7. 0.5 credit from: 0.5

0.5 credit in ECON at the 3000 level, or	
BUSI 2204 [0.5]	Basic Marketing

#### 8. 2.5 credits in: 2.5

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

#### 9. 2.5 credits in: 2.5

CHEM 2303 [0.5]	Analytical Chemistry II
BIOL 1103 [0.5]	Foundations of Biology I
BIOL 1104 [0.5]	Foundations of Biology II
BIOL 2104 [0.5]	Introductory Genetics
BIOL 2303 [0.5]	Microbiology
BIOL 3104 [0.5]	Molecular Genetics

#### 10. 0.5 credit in: 0.5

BIOC 2200 [0.5]	Cellular Biochemistry
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#### 11. 1.5 credits in: 1.5

MATH 1007 [0.5]	Elementary Calculus I
STAT 2507 [0.5]	Introduction to Statistical Modeling I
STAT 2509 [0.5]	Introduction to Statistical Modeling II

#### 12. 0.5 credit in: 0.5

PHYS 1007 [0.5]	Elementary University Physics I
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#### 13. 0.5 credit in Science Continuation Courses not in FOOD 0.5

#### 14. 1.0 credit in free electives 1.0

Total Credits 20.0

## Minor in Food Science (4.0 credits)

The Minor in Food Science is available to degree students registered in programs other than the Food Science and Nutrition B.Sc. Honours program. Note that there are several prerequisites in Chemistry, Biochemistry and Math that may also need to be satisfied.

### Requirements

#### 1. 0.5 credit in: 0.5

FOOD 1001 [0.5]	Introduction to Food Science
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#### 2. 0.5 credit from: 0.5

FOOD 2001 [0.5]	Principles of Nutrition
FOOD 2002 [0.5]	Food Processing

#### 3. 3.0 credits in FOOD at 2000-level or higher 3.0

#### 4. The remaining requirements of the major discipline(s) and degree must be satisfied.

Total Credits 4.0

## 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 Bachelor of Science Honours, Major, or General programs 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 B.Sc. Honours, Major, or General degree programs 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

<b>Biochemistry</b>	
BIOC 2200 [0.5]	Cellular Biochemistry
BIOC 4001 [0.5]	Methods in Biochemistry
BIOC 4201 [0.5]	Advanced Cell Culture and Tissue Engineering
<b>Biology</b>	
BIOL 1103 [0.5]	Foundations of Biology I
BIOL 1104 [0.5]	Foundations of Biology II
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 2600 [0.5]	Ecology
<b>Chemistry</b>	
CHEM 1001 [0.5]	General Chemistry I
CHEM 1002 [0.5]	General Chemistry II
CHEM 1005 [0.5]	Elementary Chemistry I
CHEM 1006 [0.5]	Elementary Chemistry II
CHEM 2103 [0.5]	Physical Chemistry I
CHEM 2203 [0.5]	Organic Chemistry I
CHEM 2204 [0.5]	Organic Chemistry II
CHEM 2302 [0.5]	Analytical Chemistry I
CHEM 2303 [0.5]	Analytical Chemistry II
CHEM 2800 [0.5]	Foundations for Environmental Chemistry
<b>Earth Sciences</b>	
ERTH 1006 [0.5]	Exploring Planet Earth
ERTH 1009 [0.5]	The Earth System Through Time
ERTH 2102 [0.5]	Mineralogy to Petrology
ERTH 2404 [0.5]	Engineering Geoscience
ERTH 2802 [0.5]	Field Geology I
ERTH 3111 [0.5]	Vertebrate Evolution: Mammals, Reptiles, and Birds
ERTH 3112 [0.5]	Vertebrate Evolution: Fish and Amphibians
ERTH 3204 [0.5]	Mineral Deposits
ERTH 3205 [0.5]	Physical Hydrogeology
ERTH 3806 [0.5]	Structural Geology
<b>Food Sciences</b>	
FOOD 3001 [0.5]	Food Chemistry
FOOD 3002 [0.5]	Food Analysis
FOOD 3005 [0.5]	Food Microbiology
<b>Geography</b>	
GEOG 1010 [0.5]	Global Environmental Systems
GEOG 3108 [0.5]	Soil Properties
<b>Neuroscience</b>	
NEUR 3206 [0.5]	Sensory and Motor Neuroscience
NEUR 3207 [0.5]	Integrative Neuroscience
NEUR 4600 [0.5]	Advanced Lab in Neuroanatomy

## Physics

PHYS 1001 [0.5]	Foundations of Physics I
PHYS 1002 [0.5]	Foundations of Physics II
PHYS 1003 [0.5]	Introductory Mechanics and Thermodynamics
PHYS 1004 [0.5]	Introductory Electromagnetism and Wave Motion
PHYS 1007 [0.5]	Elementary University Physics I
PHYS 1008 [0.5]	Elementary University Physics II
PHYS 2202 [0.5]	Wave Motion and Optics
PHYS 2604 [0.5]	Modern Physics I
PHYS 3007 [0.5]	Third Year Physics Laboratory: Selected Experiments and Seminars
PHYS 3606 [0.5]	Modern Physics II
PHYS 3608 [0.5]	Modern Applied Physics

## 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 EARTH 2415 which may be used only as a free elective for any B.Sc. program. Students in Earth Sciences programs may use EARTH 2401, EARTH 2402, and EARTH 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)  
MATH (Mathematics)  
NEUR (Neuroscience)  
PHYS (Physics), except PHYS 2903  
Science Geography Courses (see list above)  
Science Psychology Courses (see list above)  
STAT (Statistics)  
TSES (Technology, Society, Environment) except TSES 2305. Biology General, Major, and Honours 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  
CHEM (Chemistry) except CHEM 1003, CHEM 1004 and CHEM 1007  
COMP (Computer Science) except COMP 1001  
ERTH (Earth Sciences) except EARTH 1010, EARTH 1011 and EARTH 2415. Earth Sciences students may use EARTH 2401, EARTH 2402, and EARTH 2403 only as free electives.  
Engineering  
ENSC 2001  
FOOD (Food Science and Nutrition)  
GEOM (Geomatics)  
HLTH (Health Science)  
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 General, Major and Honours students may use these courses only as free electives.

### 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 (GEO) 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

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]	Calculus: with Applications to 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-op option on their degree can apply for admission via the co-operative education program website. To view application deadlines, visit [carleton.ca/co-op](http://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.

### English Language Proficiency

Students admitted to Carleton based on CAEL, IELTS or TOEFL assessments and who are required to take an ESL course must take and pass the Oral Proficiency in Communicative Settings (OPECS) Test. The test must be taken before being permitted to register in COOP 1000. Admission to the co-op program can be confirmed with a minimum score of 4+.

## 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 terms prior to their first work term and will be notified when to register.

### 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 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 Food Science: 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]

In addition to the following:

1. Registered as a full-time student in the Bachelor of Science Honours in Food Science;
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: FOOD 3001, FOOD 3002, FOOD 3003, FOOD 3004, and FOOD 3005

B.Sc. Honours Food Science students must successfully complete three (3) work terms to obtain the co-op designation.

**Work Term Course:** FOOD 3999

**Work/Study Pattern:**

Year 1		Year 2		Year 3		Year 4		Year 5	
Term	Pattern	Term	Pattern	Term	Pattern	Term	Pattern	Term	Pattern
Fall		Fall	S	Fall	S	Fall	W/S	Fall	S
Winter		Winter	S	Winter	S	Winter	W/S	Winter	S
Summer		Summer		Summer	O/W	Summer	O/W		

### Legend

**S:** Study

**W:** Work

**O:** Optional

\* indicates recommended work study pattern

\*\* student finds own employer for this work-term.

## Admissions Information

Admission Requirements are for the 2019-20 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. An overall average of at least 70% is normally required to be considered for admission. Some programs may also require specific course prerequisites and prerequisite averages and/or supplementary admission portfolios. Higher averages are required for admission to programs for 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 by 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. (General)
- B.Sc. (Major)

## Admission Requirements

### 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.

### Major Program

### General Program

## First Year

The Ontario Secondary School Diploma (OSSD) or equivalent including a minimum of six 4U or M courses. The six 4U or M courses must include Advanced Functions and two of Calculus and Vectors, Biology, Chemistry, Earth and Space Science or Physics (Calculus and Vectors is strongly recommended). For the B.Sc. Major in Physics. 4U Physics is strongly recommended. Equivalent courses may be substituted between the old and new Ontario mathematics curriculum.

## Advanced Standing

For entry to a General or 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 General or 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.

## Food Science (FOOD) Courses

### FOOD 1001 [0.5 credit]

#### Introduction to Food Science

Overview of the food industry. Production, processing, product development, packaging, chemistry, analysis, microbiology. Elements risk assessment, policy making and regulation.

Lectures three hours a week.

### FOOD 2001 [0.5 credit]

#### Principles of Nutrition

Roles of nutrients, lipids, proteins, carbohydrates, fluids and electrolytes. Digestion, absorption, transport, energy metabolism. Disorders including diabetes, cardiovascular disease and osteoporosis. Nutrition through the life cycle.

Prerequisite(s): CHEM 1002, BIOL 1103.

Lectures three hours a week.

### FOOD 2002 [0.5 credit]

#### Food Processing

Principles of major techniques used in food processing and preservation. Processing of specific food groups including cereals, oilseeds, dairy, beverages and frozen foods. Effects of processing on physico-chemical, rheological, and sensory characteristics. Role of research and development in food industry.

Prerequisite(s): FOOD 1001.

Lectures three hours a week.

### FOOD 2003 [0.5 credit]

#### Regulation of the Canadian Food Industry

Regulation of the Canadian food industry including regulators, regulatory powers, the process of enacting laws/regulation and food safety requirements. Food composition, standardization, advertising, labeling, packaging, ingredients, additives, and fortification requirements. Inspection, enforcement and compliance powers and policies.

Prerequisite(s): ECON 1000 and second year standing in the Food Science and Nutrition program.

Lectures three hours per week.

### FOOD 2004 [0.5 credit]

#### Scientific Writing in Food Science

Principles of effective scientific writing, including critical thinking, appropriate to food science and nutrition. Applicable to laboratory reports, literature reviews, memoranda, position statements, and policy analysis.

Includes: Experiential Learning Activity

Prerequisite(s): FOOD 1001 and second-year standing in Food Science.

Workshop four hours a week.

### FOOD 3001 [0.5 credit]

#### Food Chemistry

Chemistry of the major components of foods such as proteins, lipids, carbohydrates and of the minor components such as enzymes, vitamins and various additives and their relationships to food stability and degradation.

Includes: Experiential Learning Activity

Prerequisite(s): FOOD 1001, FOOD 2001, CHEM 2203, BIOC 2200.

Lectures three hours a week and laboratory three hours a week.

### FOOD 3002 [0.5 credit]

#### Food Analysis

In-depth principles and practices of food proximate analysis. Introductory concepts of food adulteration and detection. Major techniques such as chromatography, colorimetry, spectroscopy, rheology.

Includes: Experiential Learning Activity

Prerequisite(s): FOOD 1001, FOOD 2001, FOOD 3001.

Lectures three hours a week, laboratory three hours a week.

**FOOD 3003 [0.5 credit]****Food Packaging and Shelf Life**

An introduction to the materials used for food packaging, including their chemical and physical characteristics. Interactions of these materials with food products, and their effects on shelf life of food.

Prerequisite(s): FOOD 2002.

Lectures three hours a week.

**FOOD 3004 [0.5 credit]****Food Engineering**

Principles of food engineering. Unit operation in food processing, heat and mass transfer, material balances, fluid mechanics.

Prerequisite(s): FOOD 2002 and MATH 1007.

Lectures three hours a week.

**FOOD 3005 [0.5 credit]****Food Microbiology**

Foodborne diseases, microbial growth and survival, food spoilage, food fermentation. Techniques for detecting and quantifying microorganisms in foods.

Includes: Experiential Learning Activity

Prerequisite(s): FOOD 1001, FOOD 2001, BIOL 2303.

Lectures three hours a week, laboratory three hours a week.

**FOOD 3999 [0.0 credit]****Co-operative Work Term**

Provides practical experience for students enrolled in the Co-operative option. Students must receive satisfactory evaluations from their work term employer. Written and oral reports will be required. Graded as Sat or Uns.

Includes: Experiential Learning Activity

Prerequisite(s): Registration in the Food Science and Nutrition Co-operative Education option and permission of the Department.

Work term.

**FOOD 4001 [0.5 credit]****Food Quality Control**

Factors affecting quality in manufacturing and processing of foods and principles of quality control and quality assurance. Sampling plans and statistical methods.

Applications of physical, chemical, biological and microbiological tests in quality control. Quality systems and standards.

Prerequisite(s): FOOD 2002, FOOD 2003, and third or fourth year standing in the Food Science and Nutrition program.

Also offered at the graduate level, with different requirements, as FOOD 5104, for which additional credit is precluded.

Lectures three hours a week.

**FOOD 4002 [0.5 credit]****Analysis of Food Contaminants**

Official methods to identify food contaminants and adulterated foods. Includes agricultural chemicals, veterinary drugs, toxins, metals, and allergens. Interpretation of results in the context of current Canadian and international food safety regulations.

Includes: Experiential Learning Activity

Prerequisite(s): FOOD 3002.

Laboratory four hours per week, tutorial one hour a week.

**FOOD 4102 [0.5 credit]****Current Issues in Canadian Food Governance, Regulation and Policy**

Focus on the ever-changing and evolving issues in Canadian food governance, regulation and policy. Topical food safety, governance, policies, enforcement, trade and import/export issues and developments.

Prerequisite(s): FOOD 2003, and third or fourth year standing in the Food Science and Nutrition program.

Lectures three hours a week.

**FOOD 4103 [0.5 credit]****Food Safety Risk Assessment, Communication and Management**

The role of risk management in providing science-based approaches to solving food safety problems. Risk management models and practical applications in critical risk management. An examination of actual risk assessments. Risk communication is addressed.

Prerequisite(s): FOOD 2003 and third- or fourth-year standing in the Food Science program, or permission of the department.

Lectures three hours a week.

**FOOD 4201 [0.5 credit]****Advanced Nutrition and Metabolism**

Metabolism of macronutrients in the human body. Detailed catabolic and anabolic reactions of carbohydrates, lipids and proteins. Regulatory control points in healthy and diseased states. Discussion of the literature pertaining to nutrition, metabolism and chronic disease.

Prerequisite(s): FOOD 2001 and fourth year standing in the Food Science and Nutrition program.

Also offered at the graduate level, with different requirements, as FOOD 5101, for which additional credit is precluded.

Lectures three hours a week.

**FOOD 4202 [0.5 credit]****Micronutrients and Health**

Animal and plant-based sources of micronutrients. Metabolism of vitamins and minerals in the human body and associated diseases throughout the life cycle. Micronutrient supplementation to promote human health.

Prerequisite(s): FOOD 2001 and third or fourth year standing in the Food Science and Nutrition program.

Lectures three hours a week.



**FOOD 4203 [0.5 credit]****Functional Foods and Natural Health Products**

Study of the bioactive components of functional foods and natural health products, for the improvement of health and nutrition. Sources and chemistry of bioactives, mechanisms of actions, process technology, efficacy and safety. Role of research and development in industry in commercialization of new products.

Prerequisite(s): FOOD 3001.

Also offered at the graduate level, with different requirements, as FOOD 5105, for which additional credit is precluded.

Lectures three hours a week.

**FOOD 4301 [0.5 credit]****Food Toxicology**

Principles of toxicology as they apply to endogenous plant toxicants, endogenous animal poisons, mycotoxins, pesticide residues, veterinary drugs, food additives, heavy metals, and toxicants produced as a result of processing.

Prerequisite(s): FOOD 3001 and third- or fourth-year standing in the Food Science and Nutrition program.

Lectures three hours a week.

**FOOD 4905 [1.0 credit]****Food Science Honours Workshop**

Active learning in areas that include information literacy, critical evaluation of scientific literature, written and oral communication, evaluation and interpretation of results, statistics and data management. Emphasizes transferable skills that are most appropriate for non-research career paths.

Includes: Experiential Learning Activity

Precludes additional credit for FOOD 4907, FOOD 4908.

Prerequisite(s): fourth-year standing in Food Science and a minimum of 1.5 credits in FOOD at the 3000 level.

Workshop three hours a week.

**FOOD 4907 [1.0 credit]****Food Science Honours Essay and Research Proposal**

Students conduct an independent research study using library resources, and prepare a critical review and study proposal on a topic approved by a faculty supervisor. A written report and an oral poster presentation of the work are required before a grade can be assigned.

Includes: Experiential Learning Activity

Precludes additional credit for FOOD 4905, FOOD 4908, CHEM 4907 and CHEM 4908.

Prerequisite(s): fourth-year standing in the Food Science program, a minimum of 1.5 credits in FOOD at the 3000 level, minimum Major CGPA of 8.0, and permission of the department.

**FOOD 4908 [1.0 credit]****Food Science Research Project**

Students in Food Science carry out a research project under the direction of a faculty member. A written report and an oral presentation of the work are required before a grade can be assigned.

Includes: Experiential Learning Activity

Precludes additional credit for FOOD 4905, FOOD 4907, CHEM 4907 and CHEM 4908.

Prerequisite(s): Fourth-year standing in the Food Science program, a minimum of 1.5 credits in FOOD at the 3000 level, minimum Major CGPA of 8.0, and permission of the department.

Laboratory and associated work equivalent to at least eight hours per week for two terms.