

science



DEPARTMENT OF BIOLOGY

Biology & Environmental Biology programs

Undergraduate Handbook

2015/2016

Undergraduate Office

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Office Hours: Monday – Friday,

9:00am – 3:30pm

First Year office

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science.yorku.ca/biology

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Note: Any Information in this supplementary calendar is for informational purposes only. It is the students' responsibility to confirm program, faculty, degree and University requirements with the official 2015/2016 undergraduate calendar available from the York University Registrar's Office.

WELCOME—A MESSAGE FROM THE CHAIR

Biology is the scientific study of life and living organisms. Teaching and research in the Department of Biology extends from molecules to cells, organisms, populations and ecosystems. The Department of Biology offers undergraduate instruction in all the major areas of biology including: cell and molecular biology, genomics, integrative physiology, development, neurobiology, ecology, biodiversity and evolution.

The Biology faculty includes accomplished and internationally renowned research scientists who are dedicated to helping students acquire critical learning, analytical and scientific skills. These skills provide students with a better understanding of the beauty, complexity and fragility of the natural world and facilitate engagement in informed discussions of scientific questions. Our goal is to provide students with an excellent well-rounded education in life sciences that can lead to fulfilling careers in industry, academia and government. We strive to inspire and engage our students through lectures, laboratory courses, field courses, seminars and independent study programs. An important component of the undergraduate program in Biology for Honours students is the opportunity to do an Honours Thesis based on laboratory and/or field investigations under the supervision of a faculty member.

The Department of Biology is housed in three separate buildings on campus: Farquharson, Lumbers, and the Life Sciences Building (LSB). All first year and some second year laboratories are offered in the new LSB with state-of-the-art teaching laboratories.

This handbook provides information that will help you choose the right undergraduate program and courses to achieve your goals in Biology. Please pay special attention to the program requirements and course prerequisites for the various programs in Biology including the Specialized Honours Program, the Honours Major Program and the Honours Minor Program. This handbook should be used in combination with the Biology website, which can be found at <http://science.yorku.ca/biology/undergraduate-program/programs/> and the Undergraduate Calendar for 2015/2016, which can be found on the Registrar's website <http://calendars.registrar.yorku.ca/>

Faculty contact information can be found on the back cover of this handbook and on the Biology website. For general questions and advice about your courses, please refer to the information in this handbook. For additional minor questions you may email biology@yorku.ca, and for more substantive issues, please contact the Undergraduate Program Director (Dr. Paula Wilson), whose contact information is on the back cover. The Biology Undergraduate Office is located in the Farquharson Building, Room 108.

I encourage you to explore the wide range of possibilities offered by Biology. Best wishes for success.

Samuel Benchimol, PhD
Professor and Chair
Department of Biology

BIOLOGY INFORMATION AND RESOURCES

CONTACT US

First Year Biology Office	Biology Undergraduate Office
102 Life Sciences Building York University 4700 Keele Street Toronto, ON M3J 1P3	108 Farquharson Life Sciences Building York University 4700 Keele Street Toronto, ON M3J 1P3
Telephone: (416) 736-5745 Email: biology@yorku.ca	Telephone: (416) 736-5311 Email: biology@yorku.ca

Undergraduate Program Director: Dr. Paula Wilson

BIOLOGY UNDERGRADUATE WEBSITE

Please visit www.science.yorku.ca/biology for news, events, and information on programs, scholarships, awards, course enrolments, and advising.

BIOLOGY UNDERGRADUATE TWITTER

Follow us on Twitter @UGBiolYorkU.

BIOLOGY UNDERGRADUATE LISTSERV

The Biology Listserv provides up-to-date information from the Undergraduate Office including changes in scheduling and course offerings, jobs, scholarships, awards, research positions, advising, events and opportunities. *All students majoring or minoring in Biology should subscribe to this Listserve.*

To subscribe:

Send the following message to listserv@yorku.ca: *subscribe ugbiol-announce <your name>*

For example: *subscribe ugbiol-announce John Doe*

Please note that any other text in the body of your email message will result in an automated message indicating an *unknown command*.

To unsubscribe:

Send the following message to listserv@yorku.ca: *SIGNOFF UGBIOL-Announce*

AN OVERVIEW OF UNDERGRADUATE PROGRAMS IN BIOLOGY

The Department of Biology offers a broad range of programs to suit the diverse interests and needs of its students.

For all programs, the first year is multi-disciplinary, comprising introductory courses in fundamental science that prepare students for more advanced study in Biology. The second-year core curriculum in Biology provides a firm grounding in each of the major organizational levels of Biology (Molecules, Cells, Organisms and Populations). A broad offering of senior courses permits students to pursue more specific areas of interest.

The Bachelor Program is a three year general degree in Biology. All Honours BSc programs are four year programs.

The Honours Major BSc Biology is flexible both in its second year core and senior course options. Students can choose courses from many different areas in biology, focus study in a particular field such as physiology, cell and molecular biology or ecology, or follow the Biomedical Science Stream. There is substantive elective room for taking courses in other areas of Science.

The Biomedical Science Stream provides a comprehensive curriculum to prepare you for a career in biomedical research, medicine and other health-related professions. Courses focus on biomedically-relevant areas of cell and molecular biology and physiology: immunology, neurobiology, molecular genetics, cancer biology, animal physiology, proteomics, etc.

The Honours Double Major and Major/Minor BSc Biology combine two disciplines of study. Students have the option of combining a major in Biology with a second science major or with a minor in almost any other discipline from the Faculties of Science, Health, LA&PS, Fine Arts, Environmental Studies.

The Specialized Honours BSc Biology is a more focused program, requiring more courses in Biology, as well as completion of an Honours Research Thesis. Through careful course choice you can design your program of study according to your interests and career plans, or you can follow a more structured program by choosing the Biotechnology Stream or Biomedical Science Stream (see Honours Major above).

The Biotechnology Stream: Biotechnology focuses on the innovative use of living organisms to create new products that improve human health, food and the environment. This stream includes courses in molecular and cell biology, genetics, chemistry and biochemistry as well as ethics.

The International BSc (iBSc) Biology degrees combine an honors program in Biology with an international component, language study, and at least one term abroad on international exchange.

The Honours Specialized degree in Biochemistry, focuses on the chemistry of life, considering biology at the molecular and sub-molecular level. This program is shared with the department of Chemistry.

The Environmental Biology Program offers Bachelor and Honours degrees focussed on the biology of environmental issues, integrating ecological theory and practice to predict, quantify, and address the impact of stressors such as habitat loss, pollutants, climate change, resource harvesting and invasive species on living systems.

The Bachelor of Applied Biotechnology is a special joint program with Seneca College that provides a practical and theoretical foundation for working in the field of biotechnology.

ADVISING AND GENERAL INFORMATION

ACADEMIC ADVISING

Many resources are available to help you understand your degree requirements, choose courses, and track your degree progress. However, it is your responsibility to ensure that you understand your requirements and track your degree progress to successfully complete your degree. With the assistance of this supplementary calendar, the University Undergraduate Calendar, and the lecture schedule, most students will be able to make their own course selections to meet degree requirements.

Science Academic Services (SAS) 352 Lumbers

Science Academic Services provides general advising to all science students. Visit SAS for any general advising question including:

- Degree checklists and degree audits
- Petitions
- Understanding Academic Decisions (Academic Warning, Fail to Gain Standing, etc)
- Requirements for programs and program changes
- General degree requirements (General Education, non-science requirements, etc)

Degree Progress

Using a degree checklist from Science Academic Services (352 LB) or the degree requirements in this handbook, students may check their own progress towards an undergraduate degree. Students are encouraged to consult the University and Biology Undergraduate websites for additional helpful information. Common advising questions are answered in our FAQ (Frequently Asked Questions) section of the biology undergraduate website under advising.

Departmental Advising

Visit the Undergraduate Office for questions pertaining to biology courses and programs, such as

- Biology course enrolments
- Letters of permission for Biology courses
- Deferred standing for a final exam in Biology
- Formal grade reappraisal for a Biology course

Departmental Advising appointments

Students with special situations (including transfer credit) who require extra assistance/information may make an appointment with the Undergraduate Program Director. Normally these appointments provide advice on specific questions; they do not repeat information provided in the group sessions or available from a checklist/website. Always obtain and consult appropriate degree checklists prior to advising appointments. Advising times and directions for making an appointment are posted on the UG website under advising.

Note: Biochemistry students should see the Undergraduate Program Director in Chemistry.

Group Advising

The department provides **mandatory group advising sessions for first year students** that are held in March/April. These sessions include a review of degree requirements, choosing second year courses, understanding the prerequisite structure

and other critical information. It is also an opportunity to get your questions answered. Following this session, most students are able to complete their enrolments for the coming year by themselves.

Group advising sessions for second year students are also held in March/April and students should attend. The focus of these sessions include choosing third and fourth year courses, completing your degree, what to do if you are not meeting the GPA requirements, information about the honours thesis course.

GRADES AND GRADING SCHEMES

Courses in Biology are graded according to the following scale. The grade point values are used to compute averages. Only courses taken at York University are included in the grade point averages.

The letter-grade system (not percent range) is the fundamental system of assessment of performance in undergraduate programs at York University.

Grade	Grade Point	Per Cent Range*	Description
A+	9	90-100	Exceptional
A	8	80-89	Excellent
B+	7	75-79	Very Good
B	6	70-74	Good
C+	5	65-69	Competent
C	4	60-64	Fairly Competent
D+	3	55-59	Passing
D	2	50-54	Marginally Passing
E	1	(Marginally below 50%)	Marginally Failing
F	0	(Below 50%)	Failing

* **The percentages indicated are not part of the official grading scheme and are meant only to be used as guidelines.** Typically averages below 40% are considered F. **Note:** all of the above-noted grades are used to calculate averages and credits.

Definitions of Grading Descriptions

Grade	Description	Definition
A+	Exceptional	Thorough knowledge of concepts and/or techniques and exceptional skill or great originality in the use of those concepts/techniques in satisfying the requirements of an assignment or course.
A	Excellent	Thorough knowledge of concepts and/or techniques together with a high degree of skill and/or some elements of originality in satisfying the requirements of an assignment or course.
B+	Very Good	Thorough knowledge of concepts and/or techniques together with a fairly high degree of skill in the use of those concepts/techniques in satisfying the requirements of an assignment or course.
B	Good	Good level of knowledge of concepts and/or techniques together with considerable skill in using them to satisfy the requirements of an assignment or course.
C+	Competent	Acceptable level of knowledge of concepts and/or techniques together with considerable skill in using them to satisfy the requirements of an assignment or course.
C	Fairly Competent	Acceptable level of knowledge of concepts and/or techniques together with some skill in using them to satisfy the requirements of an assignment or course.
D+	Passing	Slightly better than minimal knowledge of required concepts and/or techniques together with some ability to use them in satisfying the requirements of an assignment or course.
D	Barely Passing	Minimum knowledge of concepts and/or techniques needed to satisfy the requirements of an assignment or course.
E	Marginally Failing	
F	Failing	

Calculation of Averages

Two types of averages are calculated and reported to students: sessional and cumulative. All averages calculated for purposes such as determining eligibility to proceed and graduate are credit-weighted. Sessional grade point average: This average reflects a student's grades for a particular academic session (e.g. Fall/Winter 2012-2013 Session).

Cumulative grade point average: This average reflects a student's grades over the entire undergraduate career in a student's particular degree program.

Definitions of Pass and Fail

Passed courses: A passed course is one in which the student has achieved a grade of D or better. Failed courses: There are two failing grades on the Undergraduate Grading Scheme: E (marginal failure) and F (failure).

Grades Release Dates (Grade Reports and Transcripts)

Grades submitted by an instructor are subject to review by the teaching unit in which the course is offered and by the Faculty Council or Faculty Committee on Academic Policy and Planning. **Final course grades may be adjusted to conform to program or Faculty grades distribution profiles.** Normally, grades appear on grade reports and transcripts as soon as they are submitted to the Registrar's Office.

Calculation of Credit-Weighted Grade Point Average (GPA)

Course	Letter Grade Achieved	Grade Point Achieved	Weighted Grade Point Achieved (Credits x Grade Point)
BIOL 1000 3.0	A	8	3 x 8=24
BIOL 1001 3.0	A	8	3 x 8=24
BIOL 2010 4.0	B	6	4 x 6=24
BIOL 2020 3.0	B+	7	3 x 7=21
BIOL 2021 3.0	B+	7	3 x 7=21
BIOL 2030 4.0	C+	5	4 x 5=20
BIOL 2040 3.0	A+	9	3 x 9=27
BIOL 2050 4.0	B	6	4 x 6=24
BIOL 2070 3.0	B	6	3 x 6=18
Total credits = 30		Total grade points = 203	

Thus, credit-weighted grade point average in Biology courses = $203/30 = 6.766$

DEFERRED EXAMS

Deferred standing may be granted to undergraduate students who are unable to write their final examination at the scheduled time. In order to apply for deferred standing, students must obtain a *Final Exam/Assignment Deferred Standing Agreement* form (<http://www.registrar.yorku.ca/exams/deferred/index.htm>), to be completed by the student and the course director. This form should be accompanied by appropriate supporting documentation (for example an "Attending Physician's Statement", also available from the Registrar's website). The DSA form, together with supporting documentation, should be submitted to the Undergraduate Office (or course director) within 5 working days of the missed examination.

If the course director grants deferred standing, the agreement should describe the arrangement that has been agreed upon by the student and course director regarding how and when the course will be completed or exam written.

Please Note:

- **Course directors are not obliged to grant deferred standing and are not obliged to provide a rationale for the decision.** Should the course director decline to grant (in other words, prefer to have the decision made by the petitions committee), he/she should indicate it on the DSA form. You then must submit an academic petition for deferred standing.
- A petition application can be obtained from the Registrar's website and should be submitted to the Registrar within one week following a missed examination or the last day to submit coursework, together with supporting documentation.
- When preparing a DSA or petition, you must use the most current forms available from the Registrar's website.
- If you miss a final exam, the final grade will appear as an F on your transcript until deferred standing has been approved and the Registrar is notified, at which time the Registrar will convert it to DEF.

There is no provision for rewriting a final examination to improve a final grade.

When students do not or cannot write a mid-term examination (not held during the formal examination period), alternate arrangements should be made with the course director before the last day of classes. The Deferred Standing Agreement does not apply.

Students who, because of religious commitment cannot write a formally scheduled final examination on the date scheduled, should refer to the appropriate guidelines regarding the *Religious Observance Policy and Accommodation Guidelines* (<https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm.woa/wa/regobs>).

Deferred Examination Times

It is always the student's responsibility to find out the date, time and place of the deferred exam by contacting the course director. Deferred exams may be scheduled during the regular exam period or some time during the following term at the discretion of the course director.

POLICY ON RETURNING GRADED WORK TO STUDENTS

Graded work from undergraduate courses must be returned directly to students under the supervision of the course instructor/teaching assistant/staff member. In the case of laboratory reports, normally it is the responsibility of each TA to return marked reports directly to the students during the laboratory period. Only the author of the report can pick it up. Unclaimed reports will be destroyed 1 week past the last day to request a final grade reappraisal (see Registrar's website). It is unacceptable to leave term work unattended in hallways or elsewhere.

PLAGIARISM AND ACADEMIC INTEGRITY

The Biology Department takes academic dishonesty (including plagiarism) very seriously, and will prosecute offenders. It is your responsibility to know what constitutes plagiarism and academic dishonesty. Any breach of academic honesty will be dealt with according to the University's policies, which can be found at:

<http://www.yorku.ca/academicintegrity/>

Please review the Senate Policy on Academic Honesty:

<http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/>

BETHUNE WRITING CENTRE

Need help with writing? The Bethune Writing Centre offers instruction in academic writing to students affiliated with Bethune College. If you are an undergraduate student enrolled in Science or taking a Science course you may request an appointment with a Bethune writing instructor. They can help with all typical assignments including lab reports, short essays, research papers, Honours Theses, Plans of Study, technical reports, and feasibility reports. Appointments are made online at:

<http://bethune.yorku.ca/writing/>

FACULTY RESEARCH INTERESTS

If you are interested in working with a faculty member in a research laboratory, we advise you to first find out more about their research program. Information about faculty member research is available from the Faculty of Science website.

GRADUATING

Students planning to graduate in the coming year are reminded to submit an Application to Graduate to the Registrar's office. Normally applications are completed and submitted online through MyYorku.ca. If you meet the requirements for a degree program other than the one you are currently in, you can apply by completing the application to graduate form which is available from the same website and submitting it in hard copy to the Office of the Registrar. For application deadlines, see the website:

<http://www.yorku.ca/mygrad/>

ENROLLING IN COURSES

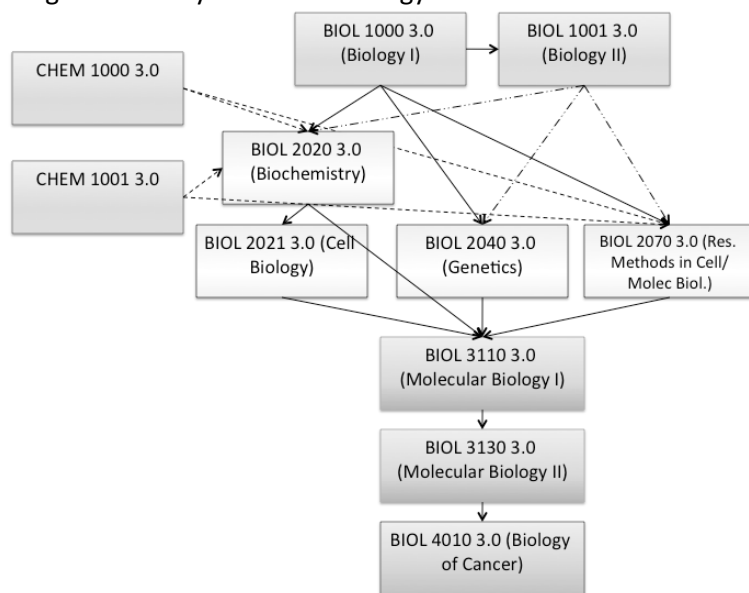
SCHEDULING AND SCHEDULE CHANGES

Up to date schedule information is available from on <https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm>

Some course offerings may change after publication of this handbook; check the Registrar's website regularly, as well as the "enrolment updates" section of the biology undergraduate website.

PREREQUISITES

- All Biology courses have pre- and/or co-requisites. Prerequisites reflect the fact that courses build upon concepts and skills gained from successfully completing earlier courses. Understanding of the material and skills taught in prerequisite courses is assumed by Course Directors.
- Certain prerequisite courses must be completed early in the program to be eligible for upper-level courses in third or fourth year. For example, BIOL 2020/2021/2070 are required for many senior courses in cell and molecular biology. Thus we advise you to review senior course offerings and note their prerequisites when choosing second year courses. For example, below is the prerequisite "tree" for taking the fourth year course Biology of Cancer.



- **If you have Transfer Credit from another institution** the enrolment system may block you from enrolling if your prerequisite courses are transfer credits. To avoid enrolment blocks, please email biology@yorku.ca **one week prior to your enrolment window**, providing your name, student number and the courses you wish to enrol in so that permission may be granted.
- Some Course Directors for senior courses are willing to admit students who lack a prerequisite on the understanding that they will have difficulty with material in the course, and may not do well. In such circumstances, permission must be granted by the Course Director, so speak directly to the course director if you wish to take a course without a prerequisite. The course director should then email biology@yorku.ca granting permission, or you can forward permission to biology@yorku.ca.

Note: priority is given to majors who have all of the prerequisites; special permissions will be granted **after** qualified Biology/Biochemistry students have had adequate opportunity to enroll.

TIPS FOR ENROLLING IN COURSES

All courses offered by the Department of Biology require direct enrolment by the student. Students should be sure to have all required pre-and co-requisites before enrolling in a course.

Do NOT enrol in a course if you lack one or more prerequisites unless you have permission from the department. Contact the first year office for first year courses, the undergraduate office for second year courses, and the course director for third and fourth year courses if you have a special situation. Be aware that prerequisites are normally strictly enforced. Enrolment priority is given to students who have all of the prerequisites.

Blocks to Enrolment: For many courses, prerequisite filters are in place to prevent students lacking prerequisites from enrolling. In courses where this system is not employed, you are likely to be de-enrolled without prior notification if you lack the pre/co-requisites.

IMPORTANT: Students with Transfer Credit from another institution may find that the enrolment system blocks you from enrolling if your prerequisite courses are transfer credits. To avoid enrolment blocks, please email biology@yorku.ca one week prior to your enrolment window, providing your name, student number and the courses you wish to enrol in so that permission may be granted.

If a course you want is completely full, continue to try to enroll during the open window period as many students drop and add courses, especially at the beginning of the term. Class sizes are usually determined by the physical size of the room, so seats will be limited. **We cannot guarantee you a place in a course that is full. We cannot not keep waiting lists for courses other than SC/BIOL 3140 4.00 and SC/BIOL 4290 4.00.**

We strongly advise you **not to enroll in courses that overlap in the lecture/lab times**. In addition to being unable to be present at all lectures/labs for both courses, you risk the possibility of having test and exam conflicts. In such cases course directors are not required to provide accommodation, so beware of the risks.

COURSES WITH LABS AND/OR TUTORIALS

Space in lab and tutorial sections are limited by equipment and room capacity, and certain lab times are in high demand. Unfortunately we cannot guarantee you space in the lab of your choice, and therefore you will need to be flexible in terms of lab time. Many of you will have to have labs in the evening or at other non-preferred times, or you may have to rearrange other aspects of your schedule (such as lecture sections and/or work) in order to create a schedule with no conflicts. This can be very frustrating, but it is not something we can control. You will appreciate that we can only create space in a full lab by de-enrolling someone else, and we cannot do that. If the lab you want is full, please enroll in another lab that fits your schedule. **Enroll as early as possible to ensure fitting labs into your timetable.** As many lab courses fill quickly, some students enroll in any available lab section to be sure to have a place in the course. Should you take this approach, you should check on-line regularly for availability and try to transfer to a section that fits your schedule. Be aware that, if you are unsuccessful, **we cannot guarantee you a place in the laboratory section of your choice, nor in a lab section that fits your schedule.**

SPECIAL COURSES

SC/BIOL 4200 and 4000 are open only to Honours Biology students and require a certain GPA, special form and permission to enrol. Please see additional information in the Course Offerings Section of this handbook. Information packages and enrolment forms are available from the Biology undergraduate website.

SC/BIOL 1500, 2900 and 2905 are not normally open to Biology majors and do not count towards BIOL credit totals for degree requirements. For permission to take BIOL 2905, please contact the undergraduate office.

SC/BIOL 3140 and 4290 may require permission to enrol. Email biology@yorku.ca if you cannot enrol but have the prerequisites. Priority for these courses is given to students who require them as part of their degree requirements (Biochemistry, Biotechnology).

ENROLMENT UPDATES

Enrolment updates are normally posted on the “Enrolment Updates” section of the Biology undergraduate website.

REPEATING COURSES

Students may repeat any course once. In this case both the original and the repeated course will appear on the transcript with a final grade. However, only the grade for the second attempt will be considered the grade of record and will be used in calculating the GPA.

Students who take a course for the third time will find that the second attempt remains grade of record and counts towards GPA and credit totals. Students must petition to request to have the third attempt count as grade of record. Students may be blocked or de-enrolled from a course for a third time if there is limited space in the course.

COURSE CREDIT EXCLUSIONS

Courses designated as exclusions of one another **may not** both be taken for degree credit. If two courses listed as Course Credit Exclusions are taken, both will appear on the transcript, but the first course will have a **“No Credit Retained” (NCR)** notation, and the mark for that course will not be included in the York University GPA. Course credit exclusions are identified in the course descriptions. Course credit exclusions for BIOL courses offered through other departments usually cannot be used in place of the BIOL course (e.g. as a program requirement).

REGARDING NATS COURSES

Natural Science (NATS) courses are designed for non-science students. Biology students cannot take Biology-related NATS courses for credit. If you have transferred from a different science area or from another Faculty (e.g., LA&PS) you may get credit if the course is not a course credit exclusion with SC/BIOL 1010 6.0, SC/BIOL 1000 3.0 or SC/BIOL 1001 3.0. Biology-related NATS courses offered by the Faculty of Science include: SC/NATS 1550, 1610, 1620, 1640, 1660, 1670, 1675, 1680, 1690, 1695, 1770, 1800A, 1850 (formerly 1800J), 2700; and Glendon College: GL/NATS 1540 6.0, 1800, 2300, 2310, 3230, 3680. If you wish to take a NATS course in spite of these restrictions, please check the CCE and NCR notes for a NATS course before enrolling.

STILL HAVE QUESTIONS?

Check out our FAQ section on our website at <http://science.yorku.ca/biology/undergraduate-program/advising/>

UNIVERSITY, SENATE, FACULTY AND DEPARTMENTAL REGULATIONS

The following informational materials are to assist students, staff and faculty to find answers to questions concerning University, Senate, Faculty and Departmental regulations:

	Website
York University Policies, Procedures & Regulations Database	http://www.yorku.ca/secretariat/policies/
Senate Policies	http://www.yorku.ca/secretariat/policies/
University Procedures	http://www.yorku.ca/secretariat/policies/
Presidential Regulations	http://www.yorku.ca/secretariat/policies/
Faculty of Science	http://science.yorku.ca/
Academic Services	http://science.yorku.ca/current-students/academic-advising/
Further Information for Potential Students	http://science.yorku.ca/future-students/

Students are reminded that they may petition on reasonable grounds, in writing, any Faculty of Science regulation. All enquiries about regulations and petition procedures should be addressed to the Registrar's Office. For further information on petitions and appeals, students should see the web site:

<http://www.registrar.yorku.ca/petitions/academic/index.htm>

Questions concerning the Undergraduate Program in Biology may be directed to Dr. Paula Wilson (Undergraduate Program Director). Students may also discuss matters of concern with the Departmental Chair, by booking an appointment with the Administrative Assistant, in Room 247 Farquharson.

UNDERGRADUATE LABORATORY INFORMATION

SAFETY

It is extremely important, and required, that all students who take part in science laboratories be safety conscious. Specific safety instructions and rules will appear in individual lab manuals. As certain special precautions may be necessary for particular experiments, it is essential that students always listen to pre-lab talks so that they can observe the instructions given by their demonstrator and/or laboratory supervisor/course director. You must observe the following general rules:

1. Wear safety glasses as required.
2. Wear a lab coat in the laboratory at all times.
3. Read and understand the coded information on the labels on bottles.
4. Do not eat, drink or smoke in laboratories.
5. Dispose of your waste in the appropriate container(s).
6. Tidy and clean up your work area at the end of the period.
7. Report all accidents that happen in the laboratories.
8. Do not wear your lab coat, or gloves, outside the lab.
9. Do not wear open toed shoes inside the lab.

Note: Some laboratories may have additional rules.

EQUIPMENT REQUIRED FOR LABORATORIES

Students are required to purchase the following items for some laboratories: safety glasses, lab coat, dissecting instruments, and laboratory manuals. Most items can be purchased from the bookstore, unless otherwise noted.

STUDENT ORGANIZATIONS

YUBS— THE YORK UNIVERSITY BIOLOGICAL SOCIETY

The York University Biology Society (YUBS) is a student-run organization dedicated to assisting all biology students from 1st to 4th year. We offer free tutoring in all biology courses as well as aid students in understanding and editing lab reports. YUBS offers free daily tutoring along with tutorials for core BIOL courses before every midterm and exam with helpful hints and stress-relieving methods for studying and preparing for your test. YUBS also organizes events such as the annual Meet the Professors Night and Professional seminars such as Medical School Seminars. For more information, check us out at the annual York Fest! For more information about our events, you can also visit our Facebook page and YU Connect called: "York University Biology Society". Take the opportunity to visit us in room 111 Lumbers or email us at biolsociety.yorku@gmail.com to get involved today! Executive members' office hours are listed on our Facebook page and on the office door.

BETHUNE COLLEGE

Please visit our website at bethune.yorku.ca

Student Ombuds Services (SOS)

Peer Advising (SOS, 208 BC) is an academic student program that provides peer advising service for York students. Peer Advisors hold seminars and presentations on career options. SOS website: <http://bethune.yorku.ca/sos/>

SOS Peer-Assisted Study Sessions (PASS)

PASS are regularly scheduled, informal review sessions facilitated by a peer leader to assist students in understanding difficult concepts in a course. Students learn how to integrate course content and study skills while working together. PASS Leaders are students who have previously done well in the course, attend all class lectures, take notes, and act as model students. PASS: <http://bethune.yorku.ca/pass/>

SOS Peer Tutoring

Peer Tutoring is hosted in the Life Sciences Help Centre (LSHC, 102F BC). The LSHC provides physical space to students who wish to study in the proximity of a Peer Tutor (PT) who will answer their questions regarding concepts relevant to BIOL 1000/1001, CHEM 1000/1001, CHEM 2020, MATH 1505 and PHYS 1xxx. PTs will field questions from students facing challenges understanding course-related concepts. Unlike PASS, this is an open-door concept, with no structured study groups. Study Groups: <http://bethune.yorku.ca/tutoring/>

SOS Peer Mentoring

Peer Mentoring assists first-year students in making a successful transition to university life. All incoming first-year Bethune College students are matched with a Peer Mentor (PM) prior to September. PMs are successful upper-year students who are trained in mentoring first year students and are available to answer questions, give advice, and help incoming students adapt to university life. Peer Mentoring: <http://bethune.yorku.ca/mentoring/>

SOS Class Representatives (CR)

The CR program assigns a CR for many of the major courses in the Faculty of Science and Engineering. The role of CRs is to act as liaisons between the professor and students in the classroom. Class Reps: <http://bethune.yorku.ca/classreps/>

CAREER INFORMATION

BIOLOGY WEBSITE ([WWW.SCIENCE.YORKU.CA/BIOLOGY](http://www.science.yorku.ca/biology))

This website contains news, information on our programs, course and enrolment updates, as well as career information for students with degrees in Biology and related fields.

YORK UNIVERSITY CAREER CENTRE

As part of the York community, the Career Centre is a team of professionals who work with students, new grads, staff, faculty, and employers to support students and new grads (up to two years after graduation) in the development of career self-management skills. For more information visit: <http://careers.yorku.ca/>

CO-REGISTRATION IN SCIENCE AND EDUCATION

Students interested in pursuing a career as a science teacher may apply for admission to the Faculty of Education. Successful applicants work concurrently to complete the requirements of a normal academic program and a professional education program. Interested students should contact the Faculty of Education. There are also consecutive programs in Education that can be completed after finishing a BSc.

PROFESSIONAL SCHOOLS

Students planning to proceed to a degree in Medicine, Dentistry or Veterinary Medicine should consult appropriate schools to obtain specific information about admission requirements. Very high grades are almost always essential, and many schools (e.g., optometry, veterinary, medicine) have specific course requirements. For additional information, you may contact Science Academic Services located in 352 Lumbers Building or SOS in Bethune College. Each year, Science Academic Services prepares a Pre-Professional Guidelines package regarding Ontario Medical/Dental/Veterinary schools.

SUMMER JOB OPPORTUNITIES

Many faculty members in the department employ undergraduate students as assistants in their laboratories during the summer. Information regarding summer laboratory positions may be posted on <http://science.yorku.ca/biology> but are typically sent out via the Biology Undergraduate Listserv. Students are also encouraged to speak with individual professors if they are interested in working with them during the summer. Other positions may be advertised as RAY positions (Research at York) on the campus work link website: <http://sfs.yorku.ca/employment/ray/>

POSTGRADUATE EDUCATION IN BIOLOGY: A CAREER IN RESEARCH

Students intending to progress beyond the BSc Honours level (to MSc or PhD) to pursue a career in research, will need to gain admission to an appropriate graduate program and be accepted to work in an individual Professor's laboratory. Requirements for entry, and the details of the program to be followed vary from institution to institution, but most require at least a B+ average in Biology in the last 2 years of study. Students who are interested in postgraduate work should consult a professor in the Department whose work is most closely related to the student's field of interest, or the Director of the Graduate Program in Biology, who will be happy to discuss these matters. Students with a high GPA are encouraged to apply for graduate scholarships to the National Science and Engineering Research Council of Canada (NSERC).

PROGRAM REQUIREMENTS

IMPORTANT: The following degree requirements apply ONLY to students admitted to a BSc program in Fall 2012 or later.

Student admitted prior to fall 2012 should consult the Faculty of Science Undergraduate Calendar (available online), or obtain a degree checklist from Science Academic Services.

GENERAL INFORMATION REGARDING PROGRAM REQUIREMENTS

All programs are governed by the appropriate regulations of the University and the Faculty of Science. Students must become familiar with these regulations, most of which may be found in the York University Undergraduate Calendar, or in the Faculty of Science and Engineering Undergraduate Calendar. If any section needs clarification, students should refer to this handbook or to a departmental adviser.

In the case of a difference between the information in this handbook and the information in the University Calendar, the University Calendar takes precedence.

Note: Students combining a minor in Biology with a major in another faculty must follow the regulations of the Faculty of the major.

NON SCIENCE REQUIREMENT

Approved Areas of Study

Students may choose courses from the following subject areas from the Faculty of Liberal Arts and Professional Studies

- Anthropology
- English
- History
- Humanities (not cross-listed with Science & Technology Studies Courses)
- Philosophy
- Political Science
- Social Science (not cross-listed with Science & Technology Studies Courses)
- Sociology
- Women's Studies

Individually Approved Courses of Study

In addition to the above areas of study, the following individual courses will be accepted. Other courses from these departments WILL NOT satisfy the non-science General Education requirement.

- Arabic* 2700 6.0
- Economics 1000 3.0, 1010 3.0, 1900 3.0
- French* 2200 6.0
- Chinese* 2200 6.0 (previously AS/CH 2700 6.0)
- Geography** 1000 6.0, 1410 6.0, 2050 6.0, 2060 3.0, 2065 3.0 (courses cannot be used to satisfy non-science general education requirements for BSc or BSc Honours candidates majoring in geography).
- Hindi* 2700 6.0
- Italian* 2751 9.0, 2761 9.0, 2791 9.0
- Japanese* 2700 6.0

- Linguistics* 1000 6.0, 2400 3.0, 2410 3.0, 2430 3.0, 2450 3.0
- Modes of Reasoning 1730 6.0, 1760 6.0, 1770 6.0
- ENVS 1000 6.0, 2150 3.0
- Dance 1340 3.0, 2340 3.0
- Film 1401 6.0, 1410 6.0, 1701 3.0, 2401 6.0
- FACS 1900 6.0 (Fine Arts Cultural Studies)
- Music 1510 6.0, 1520 6.0, 1530 6.0, 1540 6.0, 1550 6.0
- Theatre 1500 6.0
- Visual Arts 1110 6.0, 2110 6.0, 2540 6.0, 2550 6.0, 2620 6.0

Restrictions

1. Courses which are cross-listed as SC courses or which are eligible for SC credit cannot count as non-science general education courses.
2. Courses whose major focus is increased facility in the use of a language cannot count as non-science general education courses. Such courses are offered in the departments marked with an * above.
3. Quantitative courses focusing on techniques of mathematics or statistics cannot count as non-science general education courses. For example, this applies to some economics courses.
4. ** Geography courses cannot be used to satisfy non-science general education requirements for BSc or BSc Honours candidates majoring in geography.
5. *** excluding women's studies courses which are cross-listed with natural science courses.
6. Humanities and Social Science courses cross-listed with Science and Technology Studies (STS) courses cannot count as non-science general education courses.

Note:

1. General education courses may not be taken on a pass/fail basis (see Pass/Fail Grading Option in the Faculty of Science Regulations Governing Examinations and Academic Standards section of this calendar).
2. Students may not take for credit any more than three humanities/social science foundation's courses (27 credits).

MAJOR REQUIREMENTS

Biology programs require the completion of a specified number of credits in Biology courses. This includes all credits passed from courses beginning with SC/BIOL AND SC/ENVB with the following exclusions: BIOL 1500, BIOL 2900, BIOL 2905.

SCIENCE BREADTH REQUIREMENTS

Degree programs require completion of a specified number of credits in science disciplines outside the major. For programs in Biology and Environmental Biology, these include: BPHYS, CHEM (except for courses cross listed to BCHM or BIOL), EECS, EATS, MATH, PHYS, STS as well as some courses in PSYC, KINE and GEOG (consult these departments/relevant undergraduate websites to determine which of their courses count as science courses). It does **not** include courses in BCHM, BIOL, ENVB.

DEPARTMENT OF BIOLOGY UNDERGRADUATE PROGRAMS

A. BSc Biology

Bachelor Program - a 90 credit program.

Specialized Honours Program - a 120 credit program. The term “specialized” refers to specialization in Biology. Options: **Biology, Biomedical Science Stream, Biotechnology Stream**

Honours Major Program - a 120 credit program which is less specialized than Specialized Honours and requires fewer credits in Biology. Options: **Biology, Biomedical Science Stream**

Honours Double Major Program - a 120 credit program which combines a major in Biology with a second major in another discipline within the Faculty of Science.

Honours Major/Minor Program - a 120 credit program which combines a major in Biology with a minor in another discipline.

Honours Minor - a 120 credit program which combines a major in another discipline with a minor in Biology.

B. iBSc (International Bachelor of Science) Biology

Specialized Honours Program - 120 credit programs which combine a major in Biology with an international component.

Honours Major Program Options: **Biology, Biomedical Science Stream, Honours Major/Minor Program**

C. BSc Environmental Biology

Bachelor Program - a 90 credit program.

Honours Major Program - a 120 credit program .

Honours Double Major Program - a 120 credit program which combines a major in Environmental Biology with a second major in another discipline within the Faculty of Science.

Honours Major/Minor Program - a 120 credit program which combines a major in Environmental Biology with a minor in another discipline.

Honours Minor - a 120 credit program which combines a major in another discipline with a minor in Environmental Biology.

D. Joint Programs

Applied Biotechnology - a joint BSc (Tech) degree program with Seneca College

BSc Biochemistry - a joint Specialized Honours program with Biology and the Department of Chemistry

A. BSc BIOLOGY REQUIREMENTS

The **program core** (24 credits) is defined as:

- SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00);
- SC/BIOL 2070 3.00 or any three of SC/BIOL 2010 4.00, SC/BIOL 2030 4.00, SC/BIOL 2050 4.00. Both SC/CHEM 2020 3.00 and SC/CHEM2021 3.00 may replace one of these three biology courses;
- additional courses from the following for a total of at least 18 2000-level credits: SC/BIOL 2010 4.00, SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2030 4.00, SC/BIOL 2040 3.00, SC/BIOL 2050 4.00, SC/BIOL 2060 3.00, SC/BIOL 2070 3.00, both SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00.

1. Bachelor Program

A. General education:

- non-science requirement: 12 credits;
- mathematics: SC/MATH 1505 6.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: six credits from SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00) or SC/PHYS 1410 6.00, SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00.

B. Major requirements:

- the program core specified above (24 credits);
- additional credits from biology courses, as required for an overall total of at least 46 credits from biology courses, including at least 12 credits at the 3000 level or above.

C. Science breadth: 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the General Education requirement.

D. Upper level: a minimum of 18 credits at the 3000 level or above.

E. Additional elective credits, as required, for an overall total of 90 credits.

F. Standing requirements: A minimum overall grade point average of 4.00 (C) is required in order to be eligible to graduate with a BSc degree (bachelor program).

2. Specialized Honours Program

Students may follow a stream in biology, biomedical science or biotechnology.

A. General education:

- non-science requirement: 12 credits;
- mathematics: SC/MATH 1505 6.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: six credits from SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00) or SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00. Note that the biomedical science and biotechnology streams require specific courses (see below).

B. Major requirements:

Biology

- The **program core** (24 credits):
 - SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00);
 - SC/BIOL 2070 3.00 or any three of SC/BIOL 2010 4.00, SC/BIOL 2030 4.00, SC/BIOL 2050 4.00. Both SC/CHEM 2020 3.00 and SC/CHEM2021 3.00 may replace one of these three biology courses;
 - additional courses from the following for a total of at least 18 2000-level credits: SC/BIOL 2010 4.00, SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2030 4.00, SC/BIOL 2040 3.00, SC/BIOL 2050 4.00, SC/BIOL 2060 3.00, SC/BIOL 2070 3.00, both SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00.
- SC/BIOL 3100 2.00; SC/BIOL 4000 8.00 or SC/BIOL 4000 3.00;
- additional credits from biology courses, as required for an overall total of at least 68 credits from biology courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level.

Biomedical Science Stream

- SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00;
- one of SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or HH/PSYC 1010 6.00;
- The program core, as specified above (24 credits), including SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00); SC/BIOL 2020 3.00; SC/BIOL 2021 3.00; SC/BIOL 2040 3.00; SC/BIOL 2070 3.00; SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00; a minimum of one of SC/BIOL 2030 4.00 or SC/BIOL 2060 3.00;
- a minimum of nine credits chosen from the following courses: SC/BIOL 3060 4.00; SC/BIOL 3070 4.00; SC/BIOL 3110 3.00; SC/BIOL 3130 3.00; SC/BIOL 3150 3.00; SC/BIOL 3150 4.00; SC/BIOL 3155 3.00; SC/BIOL 4010 3.00;
- SC/BIOL 3100 2.00; SC/BIOL 4000 8.00 or SC/BIOL 4000 3.00;
- additional biology credits from the following courses, as required, for an overall total of 68 biology credits: SC/BIOL 2010 4.00; SC/BIOL 2030 4.00; SC/BIOL 2060 3.00; SC/BIOL 3010 3.00; SC/BIOL 3060 4.00; SC/BIOL 3070 4.00; SC/BIOL 3071 3.00; SC/BIOL 3100 2.00; SC/BIOL 3110 3.00; SC/BIOL 3120 3.00; SC/BIOL 3130 3.00; SC/BIOL 3140 4.00; SC/BIOL 3150 3.00; SC/BIOL 3150 4.00; SC/BIOL 3155 3.00; SC/BIOL 4010 3.00; SC/BIOL 4020 3.00; SC/BIOL 4030 3.00; SC/BIOL 4061 3.00; SC/BIOL 4110 4.00; SC/BIOL 4141 3.00; SC/BIOL 4150 3.00;

SC/BIOL 4151 3.00; SC/BIOL 4155 3.00; SC/BIOL 4200 3.00; SC/BIOL 4220 4.00; SC/BIOL 4270 3.00; SC/BIOL 4285 3.00; SC/BIOL 4290 4.00; SC/BIOL 4310 3.00; SC/BIOL 4320 3.00; SC/BIOL 4350 4.00; SC/BIOL 4360 4.00; SC/BIOL 4370 3.00; SC/BIOL 4380 3.00; SC/BIOL 4450 4.00; SC/BIOL 4510 3.00;

- within the 68 biology credits, at least 18 credits must be at the 3000 level or higher, of which at least 12 credits must be at the 4000 level. This must also include a minimum of seven credits from 3000 level or higher biology courses with an associated laboratory component.

Biotechnology Stream

- SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00; SC/PHYS 1410 6.00;
 - One of the following: AP/PHIL 2070 3.00 or AP/PHIL 2075 3.00 (will count towards the non-science requirement in the General Education component);
 - the program core, as specified above (24 credits), including SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00), SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2040 3.00, SC/BIOL 2060 3.00, SC/BIOL 2070 3.00 and both SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00;
 - SC/CHEM 2080 4.00; SC/CHEM 3070 3.00 or SC/CHEM 3071 3.00 or SC/CHEM 4050 3.00; SC/CHEM 3080 4.00;
 - SC/BIOL 3100 2.00; SC/BIOL 3110 3.00; SC/BIOL 3130 3.00; SC/BIOL 3140 4.00; SC/BIOL 3150 4.00;
 - SC/BIOL 4000 8.00 or SC/BIOL 4000 3.00; SC/BIOL 4290 4.00;
 - a minimum of 12 credits chosen from the following courses in lists A and B, with a minimum of six credits chosen from list A. List A: SC/BIOL 3010 3.00, SC/BIOL 3120 3.00, SC/BIOL 3155 3.00, SC/BIOL 4020 3.00, SC/BIOL 4030 3.00, SC/BIOL 4061 3.00, SC/BIOL 4285 3.00; List B: SC/BIOL 3160 4.00 (SC/BIOL 2010 4.00 is a prerequisite), SC/BIOL 4010 3.00, SC/BIOL 4040 3.00, SC/BIOL 4150 3.00, SC/BIOL 4151 3.00, SC/BIOL 4160 3.00, SC/BIOL 4270 3.00, SC/BIOL 4370 3.00, SC/BIOL 4510 3.00;
 - additional biology credits as required for an overall total of at least 57 biology credits, including at least 12 credits at the 4000 level.
- C. Science breadth: a total of 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the General Education requirement. In the biomedical science and biotechnology streams, this requirement is fully satisfied by the above requirements.
- D. Upper level: a minimum of 42 credits at the 3000 level or above.
- E. Additional elective credits, as required, for an overall total of 120 credits.
- F. Standing requirements: To declare Specialized Honours requires successful completion of at least 24 credits, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed and a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology courses completed.

To proceed in each year of a Specialized Honours program requires a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed and a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology courses completed.

To graduate in a Specialized Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

3. Honours Major Program

In addition to the Biology Honours Major, students may follow a stream in biomedical science

A. General education:

- non-science requirement: 12 credits;
- mathematics: SC/MATH 1505 6.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: six credits from SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00) or SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00. Note that the biomedical science stream requires specific courses (see below).

B. Major requirements:

Biology

- The **program core** (24 credits):
 - SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00);
 - SC/BIOL 2070 3.00 or any three of SC/BIOL 2010 4.00, SC/BIOL 2030 4.00, SC/BIOL 2050 4.00. Both SC/CHEM 2020 3.00 and SC/CHEM2021 3.00 may replace one of these three biology courses;
 - additional courses from the following for a total of at least 18 2000-level credits: SC/BIOL 2010 4.00, SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2030 4.00, SC/BIOL 2040 3.00, SC/BIOL 2050 4.00, SC/BIOL 2060 3.00, SC/BIOL 2070 3.00, both SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00.
- additional credits from biology courses, as required, for an overall total of at least 51 credits from biology courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level.

Biomedical Science Stream

- SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00;
- one of SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or HH/PSYC 1010 6.00;
- The program core, as specified above (24 credits), including SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00), SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2040 3.00, SC/BIOL 2070 3.00, SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00; a minimum of one of SC/BIOL 2030 4.00 or SC/BIOL 2060 3.00;
- a minimum of nine credits chosen from the following courses: SC/BIOL 3060 4.00; SC/BIOL 3070 4.00; SC/BIOL 3100 2.00; SC/BIOL 3110 3.00; SC/BIOL 3130 3.00; SC/BIOL 3150 3.00; SC/BIOL 3150 4.00; SC/BIOL 3155 3.00; SC/BIOL 4010 3.00;
- additional biology credits from the following courses, as required, for an overall total of 51 biology credits: SC/BIOL 2010 4.00; SC/BIOL 2030 4.00; SC/BIOL 2060 3.00; SC/BIOL 3010 3.00; SC/BIOL 3060 4.00; SC/BIOL 3070 4.00; SC/BIOL 3071 3.00; SC/BIOL 3100 2.00; SC/BIOL 3110 3.00; SC/BIOL 3120 3.00; SC/BIOL 3130 3.00; SC/BIOL 3140 4.00; SC/BIOL 3150 3.00; SC/BIOL 3150 4.00; SC/BIOL 3155 3.00; SC/BIOL 4010 3.00; SC/BIOL 4020 3.00; SC/BIOL 4030 3.00; SC/BIOL 4061 3.00; SC/BIOL 4110 4.00; SC/BIOL 4141 3.00; SC/BIOL 4150 3.00;

SC/BIOL 4151 3.00; SC/BIOL 4155 3.00; SC/BIOL 4200 3.00; SC/BIOL 4220 4.00; SC/BIOL 4270 3.00; SC/BIOL 4285 3.00; SC/BIOL 4290 4.00; SC/BIOL 4310 3.00; SC/BIOL 4320 3.00; SC/BIOL 4350 4.00; SC/BIOL 4360 4.00; SC/BIOL 4370 3.00; SC/BIOL 4380 3.00; SC/BIOL 4450 4.00; SC/BIOL 4510 3.00;

- within the 51 biology credits at least 18 credits must be at the 3000 level or higher, of which at least 12 credits must be at the 4000 level. This must also include a minimum of seven credits from 3000 level or higher biology courses with an associated laboratory component.

- C. Science breadth: a total of 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the General Education requirement. In the biomedical science stream this requirement is fully satisfied by the above requirements.
- D. Upper level: 42 credits at the 3000 level or above.
- E. Additional elective credits, as required, for an overall minimum total of 85 credits from science disciplines (including the major) and an overall total of 120 credits.
- F. Standing requirements: To graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

4. **Honours Double Major Program**

All Honours BSc degree candidates should consult departmental advisers as early as possible concerning course requirements for particular Honours Double Major programs. Possible subject combinations for Honours Double Major BSc degree programs are listed under Undergraduate Degree Programs in the Faculty of Science Undergraduate Degree and Certificate Programs section. Students should consult with a departmental advisor to plan their studies in order to meet the requirements for both majors and their prerequisites.

A. General education:

- non-science requirement: 12 credits;
- mathematics: SC/MATH 1505 6.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00; foundational science: six credits from SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00) or SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00.

B. Major requirements:

- SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00);
- at least 12 credits from 2000-level biology courses in the program core;
- additional credits from biology courses, as required for an overall total of at least 42 credits from biology courses, including at least 18 credits at the 3000 level or above, of which at least 12 credits are at the 4000 level;
- the course requirements for the second major.

- C. Science breadth: a total of 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the General Education requirement. Satisfied if the other major is another science discipline.
- D. Upper level: 42 credits at the 3000 level or above.
- E. Additional elective credits, as required for an overall total of 120 credits.
- F. Standing requirements: To graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

5. Honours Major/Minor Program

An Honours Major in biology may be combined with an Honours Minor in another subject area in an Honours Major/Minor BSc degree program. Possible subject combinations are listed under Undergraduate Degree Programs in the Faculty of Science Undergraduate Degree and Certificate Programs section.

Students may follow a stream within the Honours Major/Minor program in Biomedical Science (stream requirements are listed under the Biology Honours Major program). This stream may be combined with other approved science minors.

A. General education:

- non-science requirement: 12 credits;
- mathematics: SC/MATH 1505 6.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: six credits from SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00) or SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00.

B. Major requirements:

Biology

- The **program core** (24 credits):
 - SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00);
 - SC/BIOL 2070 3.00 or any three of SC/BIOL 2010 4.00, SC/BIOL 2030 4.00, SC/BIOL 2050 4.00. Both SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00 may replace one of these three biology courses;
 - additional courses from the following for a total of at least 18 2000-level credits: SC/BIOL 2010 4.00, SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2030 4.00, SC/BIOL 2040 3.00, SC/BIOL 2050 4.00, SC/BIOL 2060 3.00, SC/BIOL 2070 3.00, both SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00.
- additional credits from biology courses, as required, for an overall total of at least 51 credits from biology courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level.
- The course requirements for the minor.

Biomedical Science Stream

- SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00;
 - one of SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or HH/PSYC 1010 6.00;
 - the program core, as specified above (24 credits), including SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00), SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2040 3.00, SC/BIOL 2070 3.00, SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00; a minimum of one of SC/BIOL 2030 4.00 or SC/BIOL 2060 3.00;
 - a minimum of nine credits chosen from the following courses: SC/BIOL 3060 4.00; SC/BIOL 3070 4.00; SC/BIOL 3100 2.00; SC/BIOL 3110 3.00; SC/BIOL 3130 3.00; SC/BIOL 3150 3.00; SC/BIOL 3150 4.00; SC/BIOL 3155 3.00; SC/BIOL 4010 3.00;
 - additional biology credits from the following courses, as required, for an overall total of 51 biology credits: SC/BIOL 2010 4.00; SC/BIOL 2030 4.00; SC/BIOL 2060 3.00; SC/BIOL 3010 3.00; SC/BIOL 3060 4.00; SC/BIOL 3070 4.00; SC/BIOL 3071 3.00; SC/BIOL 3100 2.00; SC/BIOL 3110 3.00; SC/BIOL 3120 3.00; SC/BIOL 3130 3.00; SC/BIOL 3140 4.00; SC/BIOL 3150 3.00; SC/BIOL 3150 4.00; SC/BIOL 3155 3.00; SC/BIOL 4010 3.00; SC/BIOL 4020 3.00; SC/BIOL 4030 3.00; SC/BIOL 4061 3.00; SC/BIOL 4110 4.00; SC/BIOL 4141 3.00; SC/BIOL 4150 3.00; SC/BIOL 4151 3.00; SC/BIOL 4155 3.00; SC/BIOL 4200 3.00; SC/BIOL 4220 4.00; SC/BIOL 4270 3.00; SC/BIOL 4285 3.00; SC/BIOL 4290 4.00; SC/BIOL 4310 3.00; SC/BIOL 4320 3.00; SC/BIOL 4350 4.00; SC/BIOL 4360 4.00; SC/BIOL 4370 3.00; SC/BIOL 4380 3.00; SC/BIOL 4450 4.00; SC/BIOL 4510 3.00;
 - within the 51 biology credits at least 18 credits must be at the 3000 level or higher, of which at least 12 credits must be at the 4000 level. This must also include a minimum of seven credits from 3000 level or higher biology courses with an associated laboratory component.
- C. Science breadth: a total of 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the General Education requirement. Satisfied if the minor is another science discipline.
- D. Upper level: 42 credits at the 3000 level or above.
- E. Additional elective credits, as required for an overall total of 120 credits.
- F. Standing requirements: To graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

6. Honours Minor

- SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00);
- at least 12 credits from biology courses at the 2000 level;
- at least 9 credits from biology courses at the 3000 or higher level, normally including 6 credits at the 4000 level;
- additional credits from biology courses at the 2000 or higher level, as required for an overall total of at least 30 credits from biology courses.

Note: it is recommended that students interested in cell biology, genetics, molecular biology and biochemistry take the following courses: SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00, SC/CHEM 1000 3.00, SC/CHEM 1001 3.00, SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2040 3.00, SC/BIOL 2070 3.00, SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00, plus a minimum of nine additional credits from biology courses at the 3000 or higher level. For other areas of interest, students are advised to choose their 2000-level biology courses wisely, based on the prerequisites for the courses they wish to take at the 3000 or higher level. Check the course outlines in this publication for course prerequisites.

B. iBSc BIOLOGY REQUIREMENTS

All Honours iBSc degree candidates must complete an international component in addition to the normal requirements of biology and the BSc. For further information about the international bachelor of science, refer to the International Bachelor of Arts and International Bachelor of Science in the Faculty of Science Programs of Study section.

1. Specialized Honours in Biology (Honours iBSc)

A. General education:

- non-science requirement: 12 credits (may be satisfied in whole or part by courses in the international component);
- mathematics: SC/MATH 1505 6.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: six credits from SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00) or SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00.

B. Major requirements:

- the program core as specified above (24 credits);
- SC/BIOL 3100 2.00;
- SC/BIOL 4000 8.00 or SC/BIOL 4000 3.00;
- additional credits from biology courses, as required for an overall total of at least 62 credits from biology courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level.

In addition, the following must be completed for the international component:

- a minimum of 12 credits of language study in one of the languages offered at York University;
- a minimum of 12 credits of non-science courses with an international component (refer to sample list of courses in the section on international degrees), which will also serve to meet the non-science requirement of the general education component;
- an additional six credits of language study or non-science international component courses, for a total of 30 credits;
- one to two exchange terms abroad as a full-time student at an institution with which York University has a formal exchange agreement.

C. Science breadth: 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the above requirements.

D. Upper level: a minimum of 42 credits at the 3000 level or above.

E. Additional elective credits, as required, for an overall total of 120 credits.

- F. Standing requirement: To declare Specialized Honours requires successful completion of at least 24 credits, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed and a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology courses completed.

To proceed in each year of a Specialized Honours program requires a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed and a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology courses completed.

To graduate in a Specialized Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 6.00 (B) over all biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

2. **Honours Major Program (iBSc)**

Students may follow a stream within the Honours Major program in biomedical science.

A. General education:

- non-science requirement: 12 credits (may be satisfied in whole or part by courses in the international component).
- mathematics: SC/MATH 1505 6.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: six credits from SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00) or SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00.

B. Major requirements:

Biology

- the program core as specified above (24 credits);
- additional credits from biology courses, as required, for an overall total of at least 45 credits from biology courses (42 credits if SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00 are chosen in the core);

Biomedical Science Stream (iBSc)

- SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00;
- one of SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or HH/PSYC 1010 6.00;
- the program core, as specified above (24 credits), including SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00), SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2040 3.00, SC/BIOL 2070 3.00, SC/CHEM2020 3.00 and SC/CHEM 2021 3.00; a minimum of one of SC/BIOL 2030 4.00 or SC/BIOL 2060 3.00;
- a minimum of nine credits chosen from the following courses: SC/BIOL 3060 4.00; SC/BIOL 3070 4.00; SC/BIOL 3110 3.00; SC/BIOL 3130 3.00; SC/BIOL 3150 3.00 or SC/BIOL 3150 4.00; SC/BIOL 3155 3.00; SC/BIOL 4010 3.00;
- additional biology credits from the following courses, as required, for an overall total of 42 biology credits: SC/BIOL 2010 4.00; SC/BIOL 2030 4.00; SC/BIOL 2060 3.00; SC/BIOL 3010 3.00; SC/BIOL 3060 4.00; SC/BIOL

3070 4.00; SC/BIOL 3071 3.00; SC/BIOL 3100 2.00; SC/BIOL 3110 3.00; SC/BIOL 3120 3.00; SC/BIOL 3130 3.00; SC/BIOL 3140 4.00; SC/BIOL 3150 3.00; SC/BIOL 3150 4.00; SC/BIOL 3155 3.00; SC/BIOL 4010 3.00; SC/BIOL 4020 3.00; SC/BIOL 4030 3.00; SC/BIOL 4061 3.00; SC/BIOL 4110 4.00; SC/BIOL 4141 3.00; SC/BIOL 4150 3.00; SC/BIOL 4151 3.00; SC/BIOL 4155 3.00; SC/BIOL 4200 3.00; SC/BIOL 4220 4.00; SC/BIOL 4270 3.00; SC/BIOL 4285 3.00; SC/BIOL 4290 4.00; SC/BIOL 4310 3.00; SC/BIOL 4320 3.00; SC/BIOL 4350 4.00; SC/BIOL 4360 4.00; SC/BIOL 4370 3.00; SC/BIOL 4380 3.00; SC/BIOL 4450 4.00; SC/BIOL 4510 3.00;

- within the 42 biology credits at least 18 credits must be at the 3000 level or higher, of which at least 12 credits must be at the 4000 level. This must also include a minimum of seven credits from 3000 level or higher biology courses with an associated laboratory component.

In addition, the following must be completed for the international component:

- a minimum of 12 credits of language study in one of the languages offered at York University;
- a minimum of 12 credits of non-science courses with an international component (refer to sample list of courses in the section on international degrees), which will also serve to meet the non-science requirement of the general education component;
- an additional six credits of language study or non-science international component courses, for a total of 30 credits;
- one to two exchange terms abroad as a full-time student at an institution with which York University has a formal exchange agreement.

C. Science breadth: 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the above requirements.

D. Upper level: a minimum of 42 credits at the 3000 level or above.

E. Additional elective credits, as required, for an overall total of 85 credits from science disciplines (including the major) and an overall total of 120 credits.

F. Standing requirements: to graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

3. **Honours Major/Minor Program (iBSc)**

Students may follow a stream within the Honours Major/Minor program in biomedical science (stream requirements are listed under the Biology Honours Major program). This stream may be combined with other approved science minors.

A. General Education:

- non-science requirement: 12 credits (may be satisfied in whole or part by courses in the international component);
- mathematics: SC/MATH 1505 6.00, or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;

- foundational science: six credits from SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00), or SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00.

B. Major requirements:

Biology

- the program core as specified above (24 credits);
- additional credits from biology courses, as required, for an overall total of at least 45 credits from biology courses (42 if SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00 are chosen in the core), including at least 18 credits at the 3000 or higher level, of which at least 12 credits are at the 4000 level;
- the course requirements for the minor.

Biomedical Science Stream

- SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00;
- one of SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or HH/PSYC 1010 6.00;
- the program core, as specified above (24 credits), including SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00), SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2040 3.00, SC/BIOL 2070 3.00, SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00; a minimum of one of SC/BIOL 2030 4.00 or SC/BIOL 2060 3.00;
- a minimum of nine credits chosen from the following courses: SC/BIOL 3060 4.00; SC/BIOL 3070 4.00; SC/BIOL 3110 3.00; SC/BIOL 3130 3.00; SC/BIOL 3150 3.00 or SC/BIOL 3150 4.00; SC/BIOL 3155 3.00; SC/BIOL 4010 3.00;
- additional biology credits from the following courses, as required, for an overall total of 42 biology credits: SC/BIOL 2010 4.00; SC/BIOL 2030 4.00; SC/BIOL 2060 3.00; SC/BIOL 3010 3.00; SC/BIOL 3060 4.00; SC/BIOL 3070 4.00; SC/BIOL 3071 3.00; SC/BIOL 3100 2.00; SC/BIOL 3110 3.00; SC/BIOL 3120 3.00; SC/BIOL 3130 3.00; SC/BIOL 3140 4.00; SC/BIOL 3150 3.00; SC/BIOL 3150 4.00; SC/BIOL 3155 3.00; SC/BIOL 4010 3.00; SC/BIOL 4020 3.00; SC/BIOL 4030 3.00; SC/BIOL 4061 3.00; SC/BIOL 4110 4.00; SC/BIOL 4141 3.00; SC/BIOL 4150 3.00; SC/BIOL 4151 3.00; SC/BIOL 4155 3.00; SC/BIOL 4200 3.00; SC/BIOL 4220 4.00; SC/BIOL 4270 3.00; SC/BIOL 4285 3.00; SC/BIOL 4290 4.00; SC/BIOL 4310 3.00; SC/BIOL 4320 3.00; SC/BIOL 4350 4.00; SC/BIOL 4360 4.00; SC/BIOL 4370 3.00; SC/BIOL 4380 3.00; SC/BIOL 4450 4.00; SC/BIOL 4510 3.00;
- within the 42 biology credits at least 18 credits must be at the 3000 level or higher, of which at least 12 credits must be at the 4000 level. This must also include a minimum of seven credits from 3000 level or higher biology courses with an associated laboratory component;
- the course requirements for the minor.

In addition, the following must be completed for the international component:

- a minimum of 12 credits of language study in one of the languages offered at York University;
- a minimum of 12 credits of non-science courses with an international component (refer to sample list of courses in the section on international degrees), which will also serve to meet the non-science requirement of the general education component;
- an additional six credits of language study or non-science international component courses, for a total of 30 credits;

- one to two exchange terms abroad as a full-time student at an institution with which York University has a formal exchange agreement.
- C. Science breadth: a total of 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. On the biology stream, 15 of these 24 credits are satisfied by the General Education requirement. In the biomedical science stream this requirement is fully satisfied by the above requirements. Satisfied if the minor is another science discipline.
- D. Upper level: 42 credits at the 3000 level or above.
- E. Additional elective credits, as required, for an overall total of 120 credits.
- F. Standing requirements: To graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all biology courses completed, and a minimum cumulative credit-weighted Grade point average of 5.00 (C+) over all courses completed.

Important note: some major/minor combinations will require students to complete more than 120 credits. Students are advised to consult minor requirements as early as possible and to plan their program of study in consultation with an academic adviser and the iBSc supplemental calendar. Courses taken to meet requirements of the minor can also count as international component and/or non-science requirements for the BSc General Education Requirement. In fact, in order to complete the degree requirements within the minimum number of credits some double counting will be necessary. Minors that can, with appropriate planning, be completed with the biology major within 120 credits include African studies, culture and expression, East Asian studies, environmental studies, European studies, geography, German studies, French studies, history, international development studies, Italian culture, Italian studies, Latin American and Caribbean studies, Portuguese studies, psychology, race, ethnicity and indigeneity, South Asian studies and Spanish.

C. BSc ENVIRONMENTAL BIOLOGY REQUIREMENTS

The **program core** (35 or 36 credits) is defined as:

- SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00);
- SC/ENVB 2050 4.00; SC/BIOL 2060 3.00;
- SC/BIOL 2070 3.00 or SC/BIOL 2010 4.00, SC/BIOL 2030 4.00. (Both SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00 may replace one of the two 4 credit biology courses);
- additional courses as required for a total of at least 18 2000-level credits chosen from the following: SC/BIOL 2010 4.00, SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2030 4.00, SC/BIOL 2040 3.00, SC/BIOL 2070 3.00, SC/CHEM 2020 3.00, SC/CHEM 2021 3.00;
- SC/ENVB 3001 2.00 or SC/ENVB 3001 3.00; SC/BIOL 3170 3.00;
- SC/BIOL 4245 3.00; SC/BIOL 4255 3.00.

Note: both SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 are required as prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00 if they are chosen in the program core.

1. **Bachelor Program**

A. General education:

- non-science requirement: 12 credits. ES/ENVS 1000 6.00 is recommended for students interested in taking additional environmental studies courses;
- mathematics: SC/MATH 1505 6.00 or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00;
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: six credits from SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00), SC/PHYS 1410 6.00, SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00.

B. Major requirement:

- the program core, as specified on page 32 (35 or 36 credits);
- additional credits from the following list of courses for an overall total of at least 42 credits from environmental biology and biology courses of which at least 12 credits are at the 3000 or higher level: SC/ENVB 3002 2.00, SC/ENVB 3002 3.00, SC/BIOL 3150 4.00, SC/BIOL 3200 3.00, SC/ENVB 3250 4.00, SC/ENVB 3270 3.00, SC/ENVB 3280 4.00 (formerly SC/BIOL 4080 4.00), SC/ENVB 3290 4.00 (formerly SC/BIOL 4090 4.00), SC/BIOL 3500 3.00, SC/BIOL 4085 3.00, SC/ENVB 4095 3.00, SC/ENVB 4230 4.00, SC/ENVB 4250 3.00, SC/ENVB 4265 3.00, SC/BIOL 4305 3.00, SC/BIOL 4390 3.00;
- SC/GEOG 1400 6.00.

C. Science breadth: 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 21 of these 24 credits are satisfied by the above requirements.

D. Upper level: a minimum of 18 credits at the 3000 level or above.

- E. Additional elective credits, as required, for an overall total of 90 credits.
- F. Standing requirements: A minimum overall grade point average of 4.00 (C) is required in order to be eligible to graduate with a BSc degree (bachelor program).

2. Honours Major Program

A. General education:

- non-science requirement: 12 credits. ES/ENVS 1000 6.00 is recommended for students interested in taking additional environmental studies courses;
- mathematics: SC/MATH 1505 6.00 or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00. (**Note:** students intending to combine environmental biology with applied mathematics, chemistry, computer science, earth and atmospheric science, mathematics, mathematics for education, physics and astronomy or statistics should not take SC/MATH 1505 6.00.);
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: six credits from SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00), SC/PHYS 1410 6.00, SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00.

Note: both SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 are required as prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00 in the program core.

B. Major requirements:

- The program core as specified on page 32 (35 or 36 credits);
- SC/ENVB 4700 3.00;
- additional credits from the following list of courses for an overall total of at least 51 credits from environmental biology and biology courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits must be at the 4000 level: SC/ENVB 3002 2.00, SC/ENVB 3002 3.00, SC/BIOL 3150 4.00, SC/BIOL 3200 3.00, SC/ENVB 3250 4.00, SC/ENVB 3270 3.00, SC/ENVB 3280 4.00 (formerly SC/BIOL 4080 4.00), SC/ENVB 3290 4.00 (formerly SC/BIOL 4090 4.00) SC/BIOL 3500 3.00, SC/BIOL 4085 3.00, SC/ENVB 4095 3.00, SC/ENVB 4230 4.00, SC/ENVB 4250 3.00, SC/ENVB 4265 3.00, SC/BIOL 4305 3.00, SC/BIOL 4390 3.00;
- SC/GEOG 1400 6.00.

C. Science breadth: 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 21 of these 24 credits are satisfied by the above requirements.

D. Upper level: a minimum of 42 credits at the 3000 level or above.

E. Additional elective credits, as required, for an overall minimum total of 85 credits from science disciplines (including the major) and an overall total of 120 credits.

F. Standing requirements: to graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all environmental biology and biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

3. Honours Double Major Program

All BSc Honours degree candidates should consult departmental advisors as early as possible concerning course requirements for particular Honours Double Major programs. Possible subject combinations for BSc Honours Double Major degree programs are listed under Undergraduate Degree Programs in the Faculty of Science Undergraduate Degree and Certificate Programs section of this calendar.

A. General education:

- non-science requirement: 12 credits. ES/ENVS 1000 6.00 is recommended for students interested in taking additional environmental studies courses:
- mathematics: SC/MATH 1505 6.00 or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00. (**Note:** students intending to combine environmental biology with applied mathematics, chemistry, computer science, earth and atmospheric science, mathematics, mathematics for education, physics and astronomy or statistics should not take SC/MATH 1505 6.00.);
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: six credits from SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00), SC/PHYS 1410 6.00, SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00.

B. Major requirements:

- SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 or SC/BIOL 1010 6.00;
- SC/ENVB 2050 4.00; SC/BIOL 2060 3.00; any two of SC/BIOL 2010 4.00, SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2030 4.00, SC/BIOL 2040 3.00, SC/BIOL 2070 3.00. Both SC/CHEM 2020 3.00 and SC/CHEM2021 3.00 may replace one of these two biology courses;
- SC/ENVB 3001 2.00 or SC/ENVB 3001 3.00;
- additional credits from the following list of courses for an overall total of at least 42 credits from environmental biology and biology courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits must be at the 4000 level: SC/ENVB 3002 2.00, SC/ENVB 3002 3.00, SC/BIOL 3150 4.00, SC/BIOL 3200 3.00, SC/ENVB 3250 4.00, SC/ENVB 3270 3.00, SC/ENVB 3280 4.00 (formerly SC/BIOL 4080 4.00), SC/ENVB 3290 4.00 (formerly SC/BIOL 4090 4.00) SC/BIOL 3500 3.00, SC/BIOL 4085 3.00, SC/ENVB 4095 3.00, SC/ENVB 4230 4.00, SC/ENVB 4250 3.00, SC/ENVB 4265 3.00, SC/BIOL 4305 3.00, SC/BIOL 4390 3.00;
- the course requirements for the second major.

C. Science breadth: 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 15 of these 24 credits are satisfied by the above requirements. Satisfied if the second major is another science discipline.

D. Upper level: a minimum of 42 credits at the 3000 level or above.

E. Additional elective credits, as required, for an overall total of 120 credits.

F. Standing requirements: To graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all environmental biology and biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

4. Honours Major/Minor Program

An Honours Major in environmental biology may be combined with an Honours Minor in another subject area in a BSc Honours Major/Minor degree program. Possible subject combinations are listed under Undergraduate Degree Programs in the Faculty of Science Undergraduate Degree and Certificate Programs section of this calendar.

A. General education:

- non-science requirement: 12 credits. ES/ENVS 1000 6.00 is recommended for students interested in taking additional environmental studies courses:
- mathematics: SC/MATH 1505 6.00 or six credits from SC/MATH 1013 3.00, SC/MATH 1014 3.00, SC/MATH 1025 3.00. (**Note:** students intending to combine environmental biology with applied mathematics, chemistry, computer science, earth and atmospheric science, mathematics, mathematics for education, physics and astronomy or statistics should not take SC/MATH 1505 6.00.);
- computer science: LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: six credits from SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00 (prerequisites for SC/BIOL 2020 3.00 and SC/CHEM 2020 3.00), SC/PHYS 1410 6.00, SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00.

B. Major requirements:

- the program core as specified above (35 to 36 credits);
- SC/ENVB 4700 3.00;
- additional credits from the following list of courses for an overall total of at least 51 credits from environmental biology and biology courses, including at least 18 credits at the 3000 or higher level, of which at least 12 credits must be at the 4000 level: SC/ENVB 3002 2.00, SC/ENVB 3002 3.00, SC/BIOL 3150 4.00, SC/BIOL 3200 3.00, SC/ENVB 3250 4.00, SC/ENVB 3270 3.00, SC/ENVB 3280 4.00 (formerly SC/BIOL 4080 4.00), SC/ENVB 3290 4.00 (formerly SC/BIOL 4090 4.00) SC/BIOL 3500 3.00, SC/BIOL 4085 3.00, SC/ENVB 4095 3.00, SC/ENVB 4230 4.00, SC/ENVB 4250 3.00, SC/ENVB 4265 3.00, SC/BIOL 4305 3.00, SC/BIOL 4390 3.00;
- SC/GEOG 1400 6.00;
- the course requirements for the minor.

C. Science breadth: 24 credits in science disciplines outside the major, of which three credits must be at the 2000 level or above. 21 of these 24 credits are satisfied by the above requirements. Satisfied if the minor is another science discipline.

D. Upper level: a minimum of 42 credits at the 3000 level or above.

E. Additional elective credits, as required, for an overall total of 120 credits.

F. Standing requirements: To graduate in an Honours program requires successful completion of all Faculty requirements and departmental required courses, a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all environmental biology and biology courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

5. Honours Minor

An Honours minor in environmental biology may be combined with an Honours major in another subject area. Possible subject combinations are listed under Undergraduate Degree Programs in the Faculty of Science Undergraduate Degree and Certificate Programs section of this calendar.

- SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 or SC/BIOL 1010 6.00;
- SC/ENVB 2050 4.00; SC/BIOL 2060 3.00; any two of SC/BIOL 2010 4.00, SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2030 4.00, SC/BIOL 2040 3.00. (Both SC/CHEM 2020 3.00 and SC/CHEM 2021 3.00 may substitute for one of these two biology courses.);
- SC/ENVB 3001 2.00 or SC/ENVB 3001 3.00;
- additional credits from the following list of courses for an overall total of at least nine credits from environmental biology and biology courses at the 3000 or 4000 level: SC/ENVB 3002 2.00, SC/ENVB 3002 3.00, SC/BIOL 3150 4.00, SC/BIOL 3200 3.00, SC/ENVB 3250 4.00, SC/ENVB 3270 3.00, SC/ENVB 3280 4.00 (formerly SC/BIOL 4080 4.00), SC/ENVB 3290 4.00 (formerly SC/BIOL 4090 4.0) SC/BIOL 3500 3.00, SC/BIOL 4085 3.00, SC/ENVB 4095 3.00, SC/ENVB 4230 4.00, SC/ENVB 4250 3.00, SC/ENVB 4265 3.00, SC/BIOL 4305 3.00, SC/BIOL 4390 3.00;
- additional credits from the above listed environmental biology and biology courses at the 2000 or higher level, as required for an overall total of at least 30 environmental biology or biology credits.

D. JOINT PROGRAMS

1. BSc (Tech) APPLIED BIOTECHNOLOGY - REQUIREMENTS

The Department of Biology at York University and the School of Biological Sciences and Applied Chemistry at Seneca College offer a joint BSc (Tech) degree program in Applied Biotechnology.

The York University course requirements are as follows:

BSc (Tech): 90 credits including:

45 transfer credits for successful completion of the first two and a half years of the program at the approved joint program partner Seneca College.

All students must complete the following core:

- One of AP/ECON 1900 3.00, AP/ECON 1910 3.00, AP/ECON 1000 3.00 or AP/ECON 1010 3.00;
- AP/PHIL 2070 3.00 or AP/PHIL 2075 3.00;
- SC/MATH 1505 6.00;
- LE/EECS 1520 3.00;
- SC/BIOL 2010 4.00; SC/BIOL 2030 4.00; SC/BIOL 2040 4.00; SC/BIOL 3010 3.00; SC/BIOL 3110 3.00; SC/BIOL 3130 3.00.

All students must complete a minimum of ten credits from the following list of courses:

- SC/BIOL 3160 4.00;
- SC/BIOL 4010 3.00;
- SC/BIOL 4020 3.00; SC/BIOL 4030 3.00; SC/BIOL 4040 3.00; SC/BIOL 4050 3.00; SC/BIOL 4061 3.00;
- SC/BIOL 4150 3.00;
- SC/BIOL 4151 3.00;
- SC/BIOL 4160 3.00;
- SC/BIOL 4220 4.00;
- SC/BIOL 4270 3.00;
- SC/BIOL 4285 3.00;
- SC/BIOL 4320 3.00;
- SC/BIOL 4330 3.00;
- SC/BIOL 4350 4.00;
- SC/BIOL 4370 3.00;
- SC/BIOL 4450 4.00;
- SC/BIOL 4510 3.00;
- SC/CHEM 3051 3.00;
- SC/CHEM 3070 3.00;
- SC/CHEM 3071 3.00;
- SC/CHEM 4050 3.00.

Based on the requirements noted above, students must take a minimum of 45 credits of which 30 credits must be taken at York as a minimum residency requirement. To graduate in this program, students must have a minimum overall York grade point average of 4.00 (C).

2. BSc BIOCHEMISTRY REQUIREMENTS

Specialized Honours Program

A. General education:

- non-science requirement: 12 credits;
- mathematics: SC/MATH 1013 3.00 and SC/MATH 1014 3.00;
- computer science: one of LE/EECS 1520 3.00 or LE/EECS 1530 3.00 or LE/EECS 1540 3.00;
- foundational science: SC/PHYS 1410 6.00 or SC/PHYS 1420 6.00 or SC/PHYS 1010 6.00.

B. Major requirements:

- SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 (or SC/BIOL 1010 6.00);
- SC/CHEM 1000 3.00;
- SC/CHEM 1001 3.00;
- SC/BCHM 2020 3.00; SC/BCHM 2021 3.00; SC/BIOL 2040 3.00; SC/BIOL 2070 3.00;
- SC/CHEM 2011 3.00; SC/CHEM 2020 3.00; SC/CHEM 2021 3.00; SC/CHEM 2030 3.00;
- SC/BCHM 3010 3.00; SC/BCHM 3110 3.00; SC/BCHM 3130 3.00; SC/BCHM 3140 4.00; SC/BCHM 3051 3.00; SC/CHEM 3020 3.00; SC/BCHM 4290 4.00; SC/BCHM 4000 8.00; SC/BCHM 4050 3.00;
- nine credits from any other 3000- or 4000-level biochemistry, biology or chemistry courses.

C. Science breadth: satisfied by above requirements.

D. Upper level requirement: satisfied by above requirements.

E. Additional elective credits, as required, for an overall total of at least 120 credits.

F. Standing requirements

To declare Honours requires successful completion of at least 24 credits, a minimum cumulative credit-weighted grade point average of 5.50 (B) over all science courses completed, and a minimum cumulative credit-weighted grade point average of 4.25 over all courses completed.

To proceed in each year of the Honours program requires a minimum cumulative credit-weighted grade point average of 5.50 (B) over all science courses completed, and a minimum cumulative credit-weighted overall grade point average as specified in the Academic Standards section of the Faculty of Science Regulations Governing Undergraduate Degree Requirements section.

To graduate in Specialized Honours biochemistry requires successful completion of all Faculty requirements and all required program courses, a minimum cumulative credit-weighted grade point average of 5.50 (B) over all science (SC) courses completed, and a minimum cumulative credit-weighted grade point average of 5.00 (C+) over all courses completed.

COURSE DESCRIPTIONS

BIOL 1000 3.00 Biology I - Cells, Molecular Biology and Genetics

An introduction to major unifying concepts and fundamental principles of biology, including evolution and cell theory. Topics include cells, biological energetics, metabolism, cell division and genetics. The laboratory and lecture components must be passed independently to pass the course. Three lecture hours per week; three laboratory hours in alternate weeks. One term. Three credits.

Prerequisites: OAC Biology or 12U Biology or SC/BIOL 1500 3.00; OAC Chemistry or 12U Chemistry or SC/CHEM 1500 4.00

Course Credit Exclusion: SC/BIOL 1010 6.00; SC/BIOL 1410 6.00

Textbook: Will be posted on course moodle site.

Grading: Will be posted on course moodle site.

Course Offering: Fall, Winter, Summer

Course Director: Paula Wilson (biology@yorku.ca)

Notes: Lab schedules will be available on the course website and in the lab manual which will be available in the bookstore during the first week of classes.

BIOL 1001 3.00 Biology II - Evolution, Ecology, Biodiversity and Conservation Biology

A continuation of Biology I, exploring major unifying concepts and fundamental principles of biology, building on earlier concepts. Topics include mechanisms of evolution, ecology, a survey of biodiversity and conservation biology. The laboratory and lecture components must be passed independently to pass the course. Three lecture hours per week; three laboratory hours in alternate weeks. One term. Three credits.

Prerequisites: SC/BIOL 1000 3.00

Course Credit Exclusion: SC/BIOL 1010 6.00; SC/BIOL 1410 6.00

Textbook: TBA

Grading: TBA

Course Offering: Winter

Course Director: Tamara Kelly (biology@yorku.ca)

Notes: Lab schedules will be available on the course website and in the lab manual which will be available in the bookstore during the first week of classes.

BIOL 1500 3.00 Introduction to Biology

An introductory course in biology for students needing adequate preparation for SC/BIOL 1010 6.00. The course explores underlying theories and the unity and diversity of life. Topics include evolution, cell theory, introductory biochemistry, inheritance, biodiversity, and ecology.

Prerequisites:

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall, Winter

Course Director: Robert Tsushima (sensei@yorku.ca) (Winter)

Notes: May not be taken by any student who has taken or is currently taking another university course in biology. Not eligible for Biology credit towards a Biology, Biochemistry or Environmental Biology program.

BIOL 1601, 1602, 1603 0.00 Research Practicum

This course offers the student research experience as part of a Biology research team. The student must make arrangements with a faculty member before enrolling in this course.

Prerequisites: None

Course Credit Exclusion:

Textbook: TBA

Grading: Pass/Fail

Course Offering: Fall, Winter, Summer

Course Director: Patricia Lakin-Thomas (clocklab@yorku.ca)

Notes: This course does not count for degree credit in any program. Students are expected to commit to approximately 5-10 hours per week (on average) for one term. The student and faculty member must sign a form in which they agree on the type and amount of work to be done, and the form must be approved by the Course Director before the student will be allowed to enrol. Students may enrol in this course during any term, and there is no limit to the number of terms in which they are allowed to enrol. Students will not be allowed to enrol in a biology research practicum course with their Honours Thesis (BIOL 4000) supervisor during the same terms that they are enrolled in BIOL 4000 8.00. The course evaluation will be pass/fail only. Students will be required to obtain safety training, such as WHMIS, if appropriate to the type of research undertaken. The course is intended only for students in biology or biochemistry majors. In addition, students in biophysics, environmental biology, and environmental science--life science stream are eligible to enroll.

BIOL 2010 4.00 Plant Biology

Current advances in plant biology research, highlighting plant structure, physiology, development and diversity. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: SC/BIOL 1010 6.00 or both SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 or permission of the Course Director.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Winter

Course Director: Dawn Bazely (dbazely@yorku.ca)

Notes: This course is an introduction to field botany. Non-biology major with some background in biology may enroll with permission of the Course Director. The lectures will present information about prokaryotes, algae, fungi, and plants (structure, function, and diversity; lifecycles; ecology; relevance to human society). The laboratories are integrated with lecture, and illustrate the biology diversity of algae, fungi, and non-vascular plants, and highlight key aspects of plant biology. Course website: <http://www.yorku.ca/plants>

BIOL 2020 3.00 Biochemistry

A study of the cell biology and biochemistry of biomolecules. Topics include intermediary metabolism related to bioenergetics, including the biology of mitochondria and chloroplasts, protein structure and function, nucleic acid replication, gene expression, chromosome organization and recombinant DNA technology. Three lecture hours.

Prerequisites: Both SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 or SC/BIOL 1010 6.00; both SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00, or SC/CHEM 1000 6.00.

Course Credit Exclusion: SC/BIOL 2020 4.00, SC/BCHM 2020 4.00, SC/CHEM 2050 4.00

Textbook: TBA (Fall, Summer); Biochemistry: The Molecular Basis of Life, by McKee and McKee (Winter)

Grading: TBA (Fall, Summer); Two midterm exams (25% each), Participation (5%), Final exam (45%) (Winter)

Course Offering: Fall, Winter, Summer

Course Director: Terry Kubeseski (tkubises@yorku.ca) (Fall, Summer); Emanuel Rosonina (rosonina@yorku.ca) (Winter)

Notes:

BIOL 2021 3.00 Cell Biology

A study of cell biology and aspects of related biochemistry. Topics include membranes, the endomembrane system, the cytoskeleton, cellular motility, the extracellular matrix, intercellular communication and intracellular regulation. Three lecture hours.

Prerequisites: One of the following: (1) SC/BIOL 2020 4.00, (2) SC/BCHM 2020 4.00, (3) SC/BIOL 2020 3.00, (4) SC/BCHM 2020 3.00, (5) SC/BIOL 1010 6.00 and SC/CHEM 2050 4.00, (6) SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 and SC/CHEM 2050 4.00.

Course Credit Exclusion: SC/BIOL 2021 4.00, SC/BCHM 2021 4.00.

Textbook: Alberts et al. (2014) Molecular Biology of the Cell, 6th ed., Garland Publishing.

Grading: TBA

Course Offering: Winter, Summer

Course Director: Patricia Lakin-Thomas (clocklab@yorku.ca)

Notes:

BIOL 2030 4.00 Animals

A study of the diversity of animals, their structure, physiology and evolution. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: SC/BIOL 1010 6.00 or SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00.

Course Credit Exclusion: SC/BIOL 2030 5.00, SC/BIOL 2031 4.00, SC/BIOL 2031 3.00.

Textbook: TBA

Grading: TBA

Course Offering: Fall, Winter

Course Director: Scott Kelly (spk@yorku.ca) (Fall); Andrew Donini (adonini@yorku.ca) (Winter)

Notes:

BIOL 2040 3.00 Genetics

A study of the organization and behaviour of genes and chromosomes and their roles in cells, organisms, populations and evolution. Three lecture hours, one tutorial hour.

Prerequisites: Both SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00 or SC/BIOL 1010 6.00.

Course Credit Exclusion: SC/BIOL 2040 4.00.

Textbook: TBA

Grading: TBA

Course Offering: Fall, Winter

Course Director: Tamara Kelly (tljkelly@yorku.ca) (Fall); Arthur Hilliker (hilliker@yorku.ca) (Winter)

Notes:

BIOL 2050 4.00 Ecology

A study of the interactions between organisms and their abiotic environments, presented in an evolutionary context. Includes processes of evolution, ecosystems and communities, competition, predation, population ecology and current environmental problems such as habitat loss and extinction. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: SC/BIOL 1010 6.00 or SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00. Prerequisite or corequisite: SC/BIOL 2060 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: Christopher Lortie (lortie@yorku.ca)

Notes:

BIOL 2060 3.00 Statistics for Biologists

Statistical problem solving for biologists. Basic theory for the analysis of parametric and non-parametric data. A project period is devoted to discussion and solving of statistical problems. Two lecture hours, one project period. One term. Three credits.

Prerequisites: LE/CSE 1520 3.00, or LE/CSE 1530 3.00, or LE/CSE 1540 3.00, or LE/EECS 1520 3.00, or LE/EECS 1530 3.00, or LE/EECS 1540 3.00 ; SC/MATH 1014 3.00 or SC/MATH 1505 6.00 or both SC/MATH 1013 3.00 and SC/MATH 1025 3.00 or equivalents.

Course Credit Exclusion: SC/BIOL 3090 3.00, AP/ECON 2500 3.00, AP/ECON 3210 3.00, AP/ECON 3480 3.00, AP/ECON 3500 3.00, ES/ENVS 2010 6.00, AP/SC/GEOG 2420 3.00, HH/KINE 2050 3.00, HH/KINE 3150 3.00, SC/MATH 1131 3.00, SC/MATH 2560 3.00, SC/MATH 2565 3.00, SC/MATH 2570 3.00, AP/PO

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: TBA

Notes:

BIOL 2070 3.00 Research Methods in Cell and Molecular Biology

This course focuses on laboratory techniques in the life sciences. Practical research skills are developed through experiential learning using current biochemistry, cell and molecular biology techniques. Research skills include scientific writing, data analysis/interpretation, experimental design and hypothesis testing. One lecture hour, six laboratory/practical hours per week. One term. Three credits.

Prerequisites: SC/BIOL 1010 6.00, or SC/BIOL 1000 3.00 and SC/BIOL 1001 3.00; SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: Genetics Lab (Wet) 20%, Microscopy Lab (Wet) 20%, Biotechnology Lab (Wet) 20%, Scientific Writing Lab (Dry) 20%, Final Exam 20%

Course Offering: Fall, Winter, Summer

Course Director: Yi Sheng (yisheng@yorku.ca) (Fall); Vivian Saridakis (vsaridak@yorku.ca) (Winter); TBA (Summer)

Notes:

BIOL 2601, 2602, 2603 0.00 Research Practicum

This course offers the student research experience as part of a Biology research team. The student must make arrangements with a faculty member before enrolling in this course.

Prerequisites: None

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall, Winter, Summer

Course Director: Patricia Lakin-Thomas (clocklab@yorku.ca)

Notes: This course does not count for degree credit in any program. Students are expected to commit to approximately 5-10 hours per week (on average) for one term. The student and faculty member must sign a form in which they agree on the type and amount of work to be done, and the form must be approved by the Course Director before the student will be allowed to enrol. Students may enrol in this course during any term, and there is no limit to the number of terms in which they are allowed to enrol. Students will not be allowed to enrol in a biology research practicum course with their Honours Thesis (BIOL 4000) supervisor during the same terms that they are enrolled in BIOL 4000 8.00. The course evaluation will be pass/fail only. Students will be required to obtain safety training, such as WHMIS, if appropriate to the type of research undertaken. The course is intended only for students in biology or biochemistry majors. In addition, students in biophysics, environmental biology, and environmental science--life science stream are eligible to enroll.

BIOL 2900 3.00 Clinical Microbiology for Nurses

An introductory course in medical microbiology designed for nursing students. Topics include: structure/function relationships of viruses, bacteria and fungi; physical and chemical control of microbial growth; human/microbe interactions; immunology; major infectious diseases of humans; epidemiology and public health.

Prerequisites: Entry in the collaborative Nursing program.

Course Credit Exclusion: SC/BIOL 2905 3.00, SC/BIOL 3150 3.00, SC/BIOL 3150 4.00.

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: TBA

Notes: Not eligible for biology credit towards a Biology/Biochemistry program. Not open to students who have taken SC/BIOL 3150 3.00 or SC/BIOL 3150 4.00.

BIOL 2905 3.00 Introduction to Medical Microbiology

Medical microbiology for students interested in nursing and other health fields. This course is an introduction to concepts of medical microbiology, human-microbe interactions, mechanisms of microbial diseases, control of microbial growth, immunology and epidemiology.

Prerequisites: At least 30 credits towards a degree program; 6 credits from the following: SC/BIOL 1000 3.00, SC/BIOL 1001 3.00, SC/BIOL 1010 6.00; SC/NATS 1610 6.00, SC/NATS 1650 6.00, SC/NATS 1660 6.00, SC/NATS 1670 6.00, SC/NATS1675 6.00, SC/NATS 1680 6.00, HH/KINE 2

Course Credit Exclusion: SC/BIOL 2900 3.00, SC/BIOL 3150 3.00, or SC/BIOL 3150 4.00.

Textbook: TBA

Grading: TBA

Course Offering: Fall, Winter, Summer

Course Director: TBA

Notes: Not eligible for Biology credit towards a Biology or Biochemistry program.

BIOL 3001, 3002, 3003 3.00 Field Course

A course given at one of several biological stations, the objective of which is to give the student the opportunity to study plants and animals in their natural surroundings. The departmental brochure should be consulted for further details. Two-week field course. Three credits.

Prerequisites: SC/BIOL 2050 4.00 and SC/BIOL 2060 3.00; plus other prerequisites if specified for a given module.

Course Credit Exclusion:

Textbook: TBA

Grading: The mark breakdown depends on the OUPFB module. Similarly, the nature of the assignments and any assigned readings vary depending on the field course. Most courses require a research project with the final paper due soon after the completion of the course

Course Offering: Summer

Course Director: Bridget Stutchbury (bstutch@yorku.ca)

Notes: ** Field Course Website: www.science.yorku.ca/biology/fieldcourses ** Students must be manually enrolled in this course through the Biology Department early January or prior to the session in which the course is offered. Enrolment is not possible at any other time of year. In addition to the tuition fee levied by the University, each student must pay for transportation, room and board.

BIOL 3030 4.00 Physiology of the Invertebrates

A treatment of the physiology of major invertebrate phyla with emphasis on interphyletic relationships. Laboratory exercises address the diversity and physiology of invertebrates. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: SC/BIOL 2030 4.00

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Winter

Course Director: Andrew Donini (adonini@yorku.ca)

Notes:

BIOL 3060 4.00 Animal Physiology I

Fundamental concepts in sensory, neural and behavioural physiology. The biochemical mechanisms whereby nerve cells detect and transmit information and the processes whereby information is integrated in the nervous system and gives rise to the outputs of behaviour. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2030 4.00

Course Credit Exclusion:

Textbook: Eckert Animal Physiology by Randall, Burggren and French. 5th ed, 2002. Freeman, New York.

Grading: m

Course Offering: Fall

Course Director: Dr. Colin G. H. Steel (csteel@yorku.ca)

Notes:

BIOL 3070 4.00 Animal Physiology II

The processes of digestion, osmoregulation and excretion, circulatory systems and gaseous exchange, metabolism, growth and reproduction are considered. The course adopts a comparative approach, first analyzing the basic principles underlying physiological activities, then examining the means whereby different organisms perform them. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: SC/BIOL 2030 4.00, SC/BIOL 2020 3.00, SC/BIOL 2021 3.00

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Winter

Course Director: Jean-Paul Paluzzi (paluzzi@yorku.ca)

Notes:

BIOL 3100 2.00 Current Topics in Biological Research

A review of faculty research in the Department of Biology. Students develop critical analytical skills to evaluate scientific literature and enhance communications skills in Biology. Designed to prepare students for the Honours Thesis course SC/BIOL 4000 3.0/8.0. Two lecture hours per week. Two credits.

Prerequisites:

Course Credit Exclusion:

Textbook: TBA

Grading: Several research literacy assignments and one oral/slide presentation.

Course Offering: Fall

Course Director: Samuel Benchimol (benchimo@yorku.ca)

Notes: Open only to Honours students majoring in Biology, Environmental Biology or Environmental Science (life sciences stream). Required for all students taking SC/BIOL 4000 3.0/8.0. Normally taken in the year prior to completing the Honours Thesis. The course provides a review of the research in progress by members of the Department of Biology, and provides students with the opportunity to develop critical analytical skills to evaluate scientific research papers and to enhance their written and oral communication skills in Biology.

BIOL 3110 3.00 Molecular Biology I: Nucleic Acid Metabolism

Discussion of the metabolism of DNA and RNA, including the physical-chemical properties of nucleic acids; DNA-protein interactions; chromosome structure; nucleic acid replication, repair and recombination; recombinant DNA technology. Three lecture hours. One term. Three credits.

Prerequisites: One of the following: (1) SC/BIOL 2020 4.00 or SC/BCHM 2020 4.00; SC/BIOL 2021 4.00 or SC/BCHM 2021 4.00; SC/BIOL 2040 4.00; (2) if the three credit course is taken in either one or more of SC/BIOL 2020, SC/BIOL 2021, SC/BIOL 2040, then SC/BIOL 2070 3.00

Course Credit Exclusion:

Textbook: No specific textbook required. Optional: (1) Molecular Biology of the Gene, 7th Ed. (J.D. Watson and others); (2) GENOMES, 2nd Ed. (2002) T.A. Brown

Grading: Two midterms (25% each); Final Exam (50%)

Course Offering: Fall, Summer

Course Director: Peter Cheung (yorkubiol3110@gmail.com)

Notes:

BIOL 3120 3.00 Immunobiology

The biology and chemistry of the immune response. Structure and function of antibodies; antibody diversity; anatomy and development of the immune system; cellular interactions; immunological responses in disease. Production and use of monoclonal and polyclonal antibodies. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2040 3.00, SC/BIOL 2070 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall, Winter

Course Director: TBA

Notes:

BIOL 3130 3.00 Molecular Biology II: Regulation of Gene Expression (Section M)

Gene structure and function. Mechanisms of gene expression in prokaryotes and eukaryotes. Storage and retrieval of genetic information; transcription, translation and their control. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 3110 3.00 or SC/BCHM 3110 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: Midterm 1: 25%; Midterm 2: 25%; Final exam 50%

Course Offering: Winter

Course Director: Kathi Hudak (hudak@yorku.ca) (Winter, Section M); Emanuel Rosonina (rosonina@yorku.ca) (Winter, Section N); Michael Scheid (mscheid@yorku.ca) (Summer)

Notes:

BIOL 3140 4.00 Advanced Biochemistry and Molecular Genetics Laboratory

Research techniques used in biochemistry and molecular biology, including recombinant DNA technology, are illustrated. Purification of a restriction endonuclease; isolation and mapping of bacterial plasmids, bacteriophage and recombinant molecules; polymerase chain reaction (PCR); nucleic acid hybridization. Enrolment restricted. One lecture hour, six laboratory hours two days per week, plus additional laboratory hours throughout the week. One term. Four credits.

Prerequisites: SC/BIOL 3110 3.00 or SC/BCHM 3110 3.00. SC/BIOL 3130 3.00 or SC/BCHM 3130 3.00 strongly recommended as a prerequisite or corequisite

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: Gary Sweeney (gsweeney@yorku.ca)

Notes:

BIOL 3150 4.00 Microbiology

Fundamentals of microbiology; microbial organisms; microbe-host interactions; microbial genetics and evolution; microorganisms and human disease; environmental and applied microbiology. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: One of the following: (1) SC/BIOL 2020 4.00 or SC/BCHM 2020 4.00; SC/BIOL 2021 4.00 or SC/BCHM 2021 4.00; SC/BIOL 2040 4.00; (2) if the 3 credit course is taken in either one or more of SC/BIOL 2020, SC/BIOL 2021, SC/BIOL 2040 3.00, then SC/BIOL 2070 3.00

Course Credit Exclusion: SC/BIOL 3150 3.00.

Textbook: TBA

Grading: TBA

Course Offering: Fall, Winter

Course Director: TBA

Notes:

BIOL 3155 3.00 Virology

An in-depth examination of cellular, molecular and structural aspects of virology. Molecular processes and concepts are emphasized using examples from current research literature. Virus-host interactions are investigated in various systems. Three lecture hours per week. One term. Three credits.

Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: Two term tests: 25% each, Final exam: 50%

Course Offering: Winter

Course Director: TBA

Notes:

BIOL 3170 3.00 Population and Community Ecology

A comprehensive survey of populations (spatial and temporal patterns of distribution, population growth and regulation, territoriality, life history biology) and communities (community structure, community stability and change, community development, species interactions). Reviews theory, recent research, and applications. Laboratories stress field studies and data analysis. Two lecture hours, three laboratory hours. One term. Three credits.

Prerequisites: SC/BIOL 2060 3.00, SC/BIOL 2050 4.00

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: TBA

Notes:

BIOL 3200 3.00 Processes of Evolution

The process and principles of evolution, the mechanisms by which genetic change occurs, the patterns of genetic variation and molecular studies that relate the structure of organisms to their evolution are examined. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 2040 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: Jan Sapp (jsapp@yorku.ca)

Notes: An historical examination of the process and principles of evolution, from Lamarck and Darwin to the rise of molecular phylogenetics, this course critically examines methods and theories used to investigate the diverse modes of evolutionary change today.

BIOL 3250 4.00 Experimental Design for Environmental and Evolutionary Biology

This course examines advanced concepts associated with the design and implementation of experiments in environmental and evolutionary biology. Both basic and applied designs are described and major contemporary developments summarized.

Prerequisites: SC/BIOL 2060 3.00 or an equivalent statistics course.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: Christopher Lortie (lortie@yorku.ca)

Notes:

BIOL 3280 4.00 Freshwater Biology (Formerly BIOL 4080 4.00)

The study of physical, chemical and biological aspects of freshwater aquatic ecosystems, with a focus on lake systems. Laboratory deals with taxonomy of freshwater organisms, use of limnological equipment, and analysis/interpretation of aquatic data. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: SC/CHEM 1000 3.00 and SC/CHEM 1001 3.00, SC/BIOL 2050 4.00 and SC/BIOL 2060 3.00.

Course Credit Exclusion: SC/BIOL 4080 3.00/4.00, SC/ENBV 4080 3.00/4.00

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: Roberto Quinlan (rquinlan@yorku.ca)

Notes: SC/PHYS 1510 4.00 or similar (OAC Physics, 12U Physics) is strongly recommended. Formerly known as: SC/BIOL 4080 4.00, SC/BIOL 4080 4.00

BIOL 3290 4.00 Plant Ecology (Formerly BIOL 4090 4.00)

This course reflects the diversity of topics that make up the field of plant ecology: ecosystems, plant population ecology, physiological and evolutionary ecology, plant-herbivore interactions and applied ecology. Laboratories cover field and laboratory techniques, including sampling methods. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: SC/BIOL 2010 4.00; SC/BIOL 2050 4.00; SC/BIOL 2060 3.00

Course Credit Exclusion: SC/BIOL 4090 4.00, SC/ENVB 4090 4.00

Textbook: TBA

Grading: TBA

Course Offering: Winter

Course Director: Dawn Bazely (dbazely@yorku.ca)

Notes: Formerly known as: SC/BIOL 4090 4.00, SC/ENVB 4090 4.00

BIOL 3300 3.00 Origins and Development of Biological Theories (Formerly BIOL 4310 3.00)

An analysis of the origins and development of biological theories, which may include those in evolutionary biology, ecology, biodiversity, and molecular phylogenetics. Three lecture hours. One term. Three credits.

Prerequisites:

Course Credit Exclusion: SC/BIOL 4300 3.00

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: Jan Sapp (jsapp@yorku.ca)

Notes: Open only to students in the third or final year of a biology program, or with permission of the instructor. Formerly known as: SC/BIOL 4300 3.00

BIOL 3601, 3602, 3603 0.00 Research Practicum

This course offers the student research experience as part of a Biology research team. The student must make arrangements with a faculty member before enrolling in this course.

Prerequisites: None

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall, Winter, Summer

Course Director: Patricia Lakin-Thomas (clocklab@yorku.ca)

Notes: This course does not count for degree credit in any program. Students are expected to commit to approximately 5-10 hours per week (on average) for one term. The student and faculty member must sign a form in which they agree on the type and amount of work to be done, and the form must be approved by the Course Director before the student will be allowed to enrol. Students may enrol in this course during any term, and there is no limit to the number of terms in which they are allowed to enrol. Students will not be allowed to enrol in a biology research practicum course with their Honours Thesis (BIOL 4000) supervisor during the same terms that they are enrolled in BIOL 4000 8.00. The course evaluation will be pass/fail only. Students will be required to obtain safety training, such as WHMIS, if appropriate to the type of research undertaken. The course is intended only for students in biology or biochemistry majors. In addition, students in biophysics, environmental biology, and environmental science--life science stream are eligible to enroll.

BIOL 4000 3.00 Honors Thesis

A substantial written thesis, including a literature review based on library investigations, under the supervision of a faculty member. Rules governing this course are outlined in the Department of Biology undergraduate handbook. One term. Three credits.

Prerequisites: SC/BIOL 3100 2.00

Course Credit Exclusion:

Textbook: TBA

Grading: The grade will be based on an assessment of the thesis, and its oral defense, by an examining committee comprised of the supervisor, advisor and course director. A one hour oral examination will be scheduled during the term final examination period and w

Course Offering: Fall, Summer

Course Director: Chun Peng (cpeng@yorku.ca)

Notes: Open only to Honours students majoring in Biology, Environmental Biology or Environmental Science (life sciences stream) with at least 84 credits, and a BIOL GPA of at least 6.00. **Typically students spend 4-6 hours/week preparing the thesis. There are no formal lectures in this course. Students are encouraged to find a supervisor at least 6-9 months prior to starting their Honours Thesis. An information package available from the Biology Undergraduate Office or the Undergraduate website provides more information on the Honours Thesis course including eligibility, enrolment and scheduling defense dates.**

BIOL 4000 8.00 Honors Thesis

A research thesis based on laboratory and/or field investigations under the supervision of a faculty member. Rules governing this course are outlined in the Department of Biology undergraduate handbook. Two terms. Eight credits.

Prerequisites: SC/BIOL 3100 2.00

Course Credit Exclusion:

Textbook: None

Grading: The final grade for the course is based on an assessment of the written thesis (60%) and its oral defense (40%) by the examining committee comprised of the supervisor, advisor and course director. A one hour oral examination will be scheduled during the

Course Offering: Fall, Winter, Summer

Course Director: Samuel Benchimol (benchimo@yorku.ca)

Notes: Only open to Honours students majoring in biology and environmental biology or environmental science (life sciences stream) with at least 84 credits, and a BIOL GPA of at least 6.00. The BIOL 4000 8.0 Honours Thesis course involves a significant investment of time and effort in the laboratory or field, equivalent to 8 credits of academic work. Typically students spend 10-12 hours/week (although this is likely to depend on the nature and stage of the work). There are no formal lectures in this course. Students are encouraged to find a supervisor at least 6-9 months prior to starting their Honours Thesis. An information package available from the Biology Undergraduate Office or the Biology Undergraduate website provides more information on the Honours Thesis course including eligibility, enrolment and scheduling defense dates.

BIOL 4010 3.00 Biology of Cancer

This course will explore the basic molecular and cellular concepts and principles related to the development of cancer, and medical applications to treatment and prevention of the disease. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 3130 3.00 or SC/BCHM 3130 3.00

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: TBA

Notes:

BIOL 4020 3.00 Genomics

The study of genome structure, function and evolution, with emphasis on the primary literature. Topics include: gene duplication, evolution of noncoding DNA, population genomics, horizontal gene transfer, transposable element evolution and base composition. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 2060 3.00 or SC/MATH 2560 3.00 or SC/MATH 2565 3.00 or HH/PSYC 2020 6.00 or HH/PSYC 2021 3.00 (or equivalent); SC/BIOL 3110 3.00; SC/BIOL 3200 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Winter

Course Director: Amro Zayed (zayed@yorku.ca)

Notes:

BIOL 4030 3.00 Proteomics

Contemporary proteomic methodologies and applications. Specific topics: high-throughput methods, protein identification, protein complexes, structural proteomics, sub-cellular proteomics and molecular modeling.

Prerequisites: SC/BIOL 3130 3.00

Course Credit Exclusion:

Textbook: TBA

Grading: 20% assignments, 20% midterm exam, 60% final exam.

Course Offering: Winter

Course Director: Logan Donaldson (logand@yorku.ca)

Notes: The course draws upon primary literature (papers, reviews) with an opportunity for independent study of a problem.

BIOL 4061 3.00 Cell and Molecular Biology of Development

This course presents a genetic and molecular biological approach to the field of developmental biology. Topics range from unicellular systems, both prokaryotic and eukaryotic, to more complex, multicellular systems. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2040 3.00, SC/BIOL 2070 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Winter

Course Director: John McDermott (jmcderm@yorku.ca)

Notes:

BIOL 4141 3.00 Current Topics and methods in Cell Biology

Selected topics in cell biology, such as membrane dynamics, cell cycle control, apoptosis, signal transduction and cellular rhythmicity. Presentation and critical discussion of recent research papers, emphasizing current methods and experimental design. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 3130 3.00.

Course Credit Exclusion: SC/BIOL 4140 3.00 from Fall/Winter 2002-2003 only.

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: Patricia Lakin-Thomas (clocklab@yorku.ca)

Notes: This course is organized around student presentations, and if class size permits, all students will be required to give at least one presentation.

BIOL 4150 3.00 Cellular Regulation

A detailed examination of molecular, cellular and physiological processes associated with the action of peptide hormones, neuro-transmitters and growth factors. Emphasis is on cell receptors and signal transduction mechanisms involving cyclic nucleotides and calcium. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2070 3.00. SC/BIOL 3010 3.00 and SC/BIOL 3110 3.00 strongly recommended as prerequisites or corequisites.

Course Credit Exclusion:

Textbook: None

Grading: Midterms and Final Exam

Course Offering: Winter

Course Director: Michael Scheid (mscheid@yorku.ca)

Notes:

BIOL 4151 3.00 Membrane Transport

The fundamental properties of solute transport are presented by discussing active ion pumps, passive transporters and ion channels of bacteria, plants and animals. The role of transport in regulating the intracellular environment in animals and plants is emphasized. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00. SC/BIOL 3010 3.00 and SC/BIOL 3110 3.00 strongly recommended as prerequisites or corequisites.

Course Credit Exclusion:

Textbook: TBA

Grading: Three assignments of variable weight, 40% total that may include a literature review, powerpoint presentation and research proposal; One midterm test (25%) and a final exam (35%), 60% total.

Course Offering: Fall

Course Director: Jean-Paul Paluzzi (paluzzi@yorku.ca)

Notes: This course uses Moodle.

BIOL 4155 3.00 Advanced Virology

This course investigates advanced concepts and experimental systems in virology, including recent basic and applied research that has led to major scientific innovations in medicine, agriculture and nanotechnology. Three lecture hours per week. One term.

Prerequisites: SC/BIOL 3110 3.00, SC/BIOL 3130 3.00, SC/BIOL 3155 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: Andy White (kawhite@yorku.ca)

Notes:

BIOL 4200 3.00 Selected Readings in Biology

A reading course offered by special arrangement between an individual student and a faculty supervisor which focuses on a specialized area of biology of mutual interest. The subject matter must be significantly different from that of the student's honours thesis. A student may take this course only once for credit. One term. Three credits.

Prerequisites:

Course Credit Exclusion:

Textbook: None

Grading: The grading scheme for this course is flexible and set by the supervisor, but the work involved must be equivalent to a three credit course, and the academic level must at the 4000 level; thus the course will involve substantive amounts of critical reading

Course Offering: Fall, Winter, Summer

Course Director: Paula Wilson (pjwilson@yorku.ca)

Notes: Open only to students with a science grade point average equal to or greater than 6.00. The course is designed for a student who has a genuine interest in a particular area of Biology for which no course exists in the department. The student must identify a faculty member with expertise in the area of interest, and speak to the faculty member about acting as a supervisor for this course. A list of faculty members and their research interests may be found on the Biology and/or Faculty web site. Students must be in their senior year of study. Supervisors must be full time faculty members in the Biology Department at York University. To enroll, obtain an enrolment form from 108 FS or the Undergraduate Biology website, fill out the form with your supervisor, then bring it to 108 FS for review by the course director. If you are eligible to take the course, an enrolment window will be opened for you.

BIOL 4220 4.00 Histology

Structure and function of tissues in vertebrates, with special emphasis on human histology. The laboratory deals with basic histological and histochemical techniques, such as tissue sectioning and staining, and localization of enzymes. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2070 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: Rodney Webb (raw@yorku.ca)

Notes: Other Information: This is a 4000 level course that requires students to have well developed skills. This course also requires a strong background knowledge on physiological systems and processes. Therefore, students are strongly encouraged to complete courses on animal/human physiology (BIOL 3060/3070) before enrolling in this course. Students should be prepared for the heavy lab component and be dedicated to conduct independent work that may require extra hours outside the normal three hours in the lab. Attendance is mandatory for lab sessions.

BIOL 4230 4.00 Entomology

The distinguishing characteristics, biology and economic importance of the major orders and families of insects. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: SC/BIOL 2030 4.00.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Summer

Course Director: Laurence Packer (bugsrus@yorku.ca)

Notes:

BIOL 4245 3.00 Conservation Biology

This course explores the role of biological science in efforts to conserve natural resources, systems and the organisms therein. Two lecture hours, three laboratory hours. One term. Three credits.

Prerequisites: SC/BIOL 2050 4.00, SC/BIOL 2060 3.00

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Winter

Course Director: Roberto Quinlan (rquinlan@yorku.ca)

Notes:

BIOL 4250 3.00 Birds and the Environment

A review of the adaptations of birds to different environments, behaviour and ecology, biodiversity and evolution, and current threats to the world's birds. Laboratories include field trips, a study of bird anatomy and examination of museum specimens. Two lecture hours, three laboratory hours. One term. Three credits.

Prerequisites: SC/BIOL 2050 4.00, SC/BIOL 2060 3.00

Course Credit Exclusion:

Textbook: None

Grading: Midterm(s), Final Exam, scientific poster, critique of scientific paper, lab quizzes

Course Offering: Fall

Course Director: Bridget Stutchbury (bstutch@yorku.ca)

Notes:

BIOL 4255 3.00 Biodiversity

We do not know the number of species on Earth, even to the nearest order of magnitude. This course discusses the factors that influence the number of species in an area and the importance of biodiversity to humanity. Two lecture hours, three laboratory hours. One term. Three credits.

Prerequisites:

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: Laurence Packer (bugsrus@yorku.ca)

Notes: Completion of 60 credits required, towards a degree in biology or environmental science or environmental studies, or permission of the instructor.

BIOL 4265 3.00 Biology in Environmental Management

This course summarizes our progress in conceptualizing, understanding and in solving large-scale ecological problems caused by the introduction of pollutants and exotic species to the environment. Three lecture hours. One term.

Prerequisites: SC/BIOL 2050 4.00, SC/BIOL 2060 3.00; or permission of the instructor.

Course Credit Exclusion:

Textbook: TBA

Grading: No final exams.

Course Offering: Winter

Course Director: TBA

Notes: The purpose of this course is not to provide an overview of all current international environmental problems related to pollutants or invading species. Rather it is to teach the class the tools that applied ecologists need to play their roles in identifying and solving these problems. Once they are learned, students will employ these tools in two short, related essays on pollutants and one group project on invading species.

BIOL 4270 3.00 Reproduction

Molecular, genetic, cytological and evolutionary aspects of sexual reproduction. Comparison of the regulatory genes and proteins of sexual differentiation in Saccharomyces, Drosophila, Caenorhabditis elegans, mice, human and plants. Evolutionary advantages and disadvantages of sexual reproduction; asexual reproduction through parthenogenic mechanisms. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2040 3.00, SC/BIOL 2070 3.00.

Course Credit Exclusion:

Textbook: None

Grading: TBA - Will consist of writing papers, presentations, working as a team, in-class activities.

Course Offering: Fall

Course Director: Tamara Kelly (tljkelly@yorku.ca)

Notes:

BIOL 4285 3.00 Human Molecular Genetics

The course covers the application of genetic and molecular biological techniques to study human diseases and other related areas, and discusses ethical concerns that might arise from this research. Three lecture hours. One term. Three credits.

Prerequisites: Prerequisite or corequisite: SC/BIOL 3130 3.00

Course Credit Exclusion:

Textbook: None

Grading: Midterms and Final Exam

Course Offering: Winter

Course Director: Michael Scheid (mscheid@yorku.ca)

Notes:

BIOL 4290 4.00 Biotechnology

This laboratory course covers some of the methods currently in use in biotechnology research in industry and academia. Emphasis is placed on methods for transforming eukaryotes with marker genes. Advanced methods used in molecular biology are also covered. Two lecture hours, six laboratory hours. One term. Four credits.

Prerequisites: SC/BIOL 3110 3.00 or SC/BCHM 3110 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: Lab reports 35%, Presentation 20%, Lab Quiz: 10%, Participation 10%, Final Exam 25%

Course Offering: Winter

Course Director: Vivian Saridakis (vsaridak@yorku.ca)

Notes:

BIOL 4310 3.00 Physiology of Circadian Timing

This course examines the mechanism by which cells generate 24h (circadian) rhythms, how the numerous sites of these cells are coordinated by nerves and hormones and the critical roles of human circadian clocks in health and diseases. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 2020 4.00 or SC/BIOL 2020 3.00; SC/BIOL 2021 4.00 or SC/BIOL 2021 3.00; SC/BIOL 3060 4.00.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Winter

Course Director: TBA

Notes: Life evolved in a cyclical environment alternating between the freezing darkness of night and the searing radiation of day. Early nucleated cells evolved the ability to time their various activities to occur in the most appropriate portion of daily and seasonal cycles. These cellular biological “clocks” are retained in modern organisms where they coordinate both cellular and physiological activities, which are expressed as overt rhythms ranging from sleep-wake activity rhythms to seasonal reproductive cycles. Interactions between the component “clocks” of an organism are mediated primarily by nerves and hormones, and lead to internal temporal organization of events within it. Therefore neurobiology and endocrinology are central themes of this course. The cellular and physiological principles of biological timekeeping are universal and will be illustrated by examples from insects, birds and mammals. Human applications of these principles will be discussed in depth, especially the recent advances in timing of drug treatments and in particular chemotherapy agents for cancers. Strong scientific evidence documents that many illnesses, including cancers, result from disruption of human clocks that is caused by living in a world of continuous artificial light, shift work and jet lag. Scientific protocols are now known that minimize these adverse effects of life in the 24/7 world.

BIOL 4320 3.00 Vertebrate Endocrinology

Vertebrate endocrine structure and function; synthesis and regulation of hormones; mechanisms of hormone actions; and hormonal integration of physiological processes. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2030 4.00. Course credit exclusion: HH/KINE 4448 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: Chun Peng (cpeng@yorku.ca)

Notes:

BIOL 4340 3.00 Fish Biology

A study of fish biology (ichthyology), including anatomy, systematics, physiology, behaviour and ecology of freshwater and marine fishes. Special emphasis is placed on the unique features of fishes and their functional adaptation to aquatic environments. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 2030 4.00.

Course Credit Exclusion:

Textbook: TBA

Grading: Midterm exam 18%, Final Exam 40%, Presentation 17% and Essay 25%.

Course Offering: Winter

Course Director: Scott Kelly (spk@yorku.ca)

Notes: Completion of 60 credits required.

BIOL 4350 4.00 Comparative Chordate Anatomy

A comparative study of the biology of chordate animals in which the evidence of their evolutionary relationships is emphasized. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: SC/BIOL 2030 4.00.

Course Credit Exclusion:

Textbook: Kardong, Comparative Vertebrate Anatomy: A laboratory dissection guide

Grading: Laboratory: 30%; Lecture Participation and Activities (Clicker Questions and Discussion): 5%; Group Assignment: 10%; Midterm Test: 25%; Final Exam: 30%

Course Offering: Winter

Course Director: Carol Bucking (cbucking@yorku.ca)

Notes:

BIOL 4360 3.00 Parasitology

Biology of animal parasites; developmental, structural and functional adaptations to the parasitic environments; immune and other responses of hosts; parasitic diseases. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 2030 4.00.

Course Credit Exclusion:

Textbook: TBA

Grading: Midterm examination 30%; Enquiry based learning project (EBLP) 15% Participation 5% Final examination 50%.

Course Offering: Fall

Course Director: Rodney Webb (raw@yorku.ca)

Notes: The lecture content of this course will be provided through a variety of media that will include face-to-face meetings (classroom lectures - presentations and discussions) and on-line delivery. The EBLP will require students to work in groups to produce a collective essay and an in class group presentation. Students enrolled in the course will be given access to the Moodle website where lecture-based materials will be made available throughout the course.

BIOL 4370 3.00 Neurobiology

An analysis of recent advances in neurobiology, particularly information processing and storage in nervous systems and the biochemical basis of learning, memory and behaviour. The neurobiology of addiction, diseases of the nervous system and regeneration are also discussed. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 3060 4.00

Course Credit Exclusion: AS/HH/SC/KINE 4512 3.00

Textbook: TBA

Grading: TBA

Course Offering: Fall

Course Director: Georg Zoidl (gzoidl@yorku.ca)

Notes:

BIOL 4380 3.00 Systems Neuroscience

This course investigates the neural basis of visual and auditory perception, echolocation, smell, short- and long-term memory, and motor control. Emphasis is on understanding how neural interactions analyze sensory information and control complex behaviour. Three lecture hours. One term. Three credits.

Prerequisites: SC/BIOL 3060 4.00.

Course Credit Exclusion:

Textbook: (1) Purves, D, Augustine, G.J., Fitzpatrick, D., Hall, W.C., LaMantia, A-S, McNamara, J.O. & White, L.E. Neuroscience (5th edition) Sunderland, MA: Sinauer Associates Inc.; (2) Glimcher PW, Fehr E, Rangel A, Camerer C, Poldrack RA (2009) Neuroeconomics: D

Grading: The grade for the course will be based on a midterm examination (40% of the final grade), and a final examination (60% of the final grade). There are no special assignments. Questions and Quizzes will be distributed after each lecture to support learning

Course Offering: Winter

Course Director: Thilo Womelsdorf (thiwom@yorku.ca)

Notes: This course surveys the brain mechanisms and the brain circuits that underlie visual perception, attention, emotion, decision making, and memory formation. The course emphasizes the different levels of neuronal processing in the brain: Each of the cognitive functions that are discussed in the course will be viewed from the cellular-, the circuit- and the network- level perspective. Neuronal processes at each of these levels relate in direct ways to the cognitive functions - allowing understanding normal brain functioning as well as maladaptive or dysfunctional brain functions in neuropsychiatric diseases such as depression, schizophrenia or dementia.

BIOL 4390 3.00 Population Genetics

The course focuses on theoretical and empirical population genetics and phenotypic evolution. Learning the underlying principles, students will generate, analyze and interpret population genetic data. One term or alternating term. Three lecture hours per week. Three credits.

Prerequisites: SC/BIOL 2040 3.00 or SC/BIOL 2040 4.00; SC/BIOL 2060 3.00 (or equivalent).

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Winter

Course Director: Amro Zayed (zayed@yorku.ca)

Notes:

BIOL 4410 4.00 Advanced Drosophila Genetics

A study of recent advances in Drosophila genetics. The course addresses techniques such as chromosomal analysis, lethal tagging, genetic dissection, mosaic analysis, genetic screens, transposon tagging, enhancer trapping, methods for manipulating genes in transgenic flies and genetic ablation. Three lecture hours. One term. Three credits.

Prerequisites: Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2040 3.00, SC/BIOL2070 3.00.

Course Credit Exclusion:

Textbook: None

Grading: 1 midterm, 4 reading assignments, final exam

Course Offering: Fall

Course Director: TBA

Notes:

BIOL 4450 4.00 Animal Development

Fertilization, cleavage, differentiation and development in selected animals. Three lecture hours, three laboratory hours. One term. Four credits.

Prerequisites: SC/BIOL 2020 3.00, SC/BIOL 2021 3.00, SC/BIOL 2030 4.00, SC/BIOL 2040 3.00, SC/BIOL 2070 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Winter

Course Director: Terry Kubiseski (tkubises@yorku.ca)

Notes:

BIOL 4510 3.00 Cellular and Molecular Basis of Muscle Physiology

Topics include muscle development, muscle-specific gene expression, molecular basis of muscle contraction, biochemical plasticity of muscle, sarcolemmal and nuclear signal transduction in muscle. Three lecture hours per week. One term.

Prerequisites: AS/HH/SC/KINE 2011 3.00, or SC/BIOL 3060 4.00 and SC/BIOL 3070 4.00.

Course Credit Exclusion:

Textbook: None

Grading: Midterm 1 – 30%; Midterm 2 – 30%; Final Exam – 40%

Course Offering: Fall

Course Director: Robert Tsushima (sensei@yorku.ca)

Notes:

BIOL 4601, 4602, 4603 0.00 Research Practicum

This course offers the student research experience as part of a Biology research team. The student must make arrangements with a faculty member before enrolling in this course.

Prerequisites: None

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Fall, Winter, Summer

Course Director: Patricia Lakin-Thomas (clocklab@yorku.ca)

Notes: This course does not count for degree credit in any program. Students are expected to commit to approximately 5-10 hours per week (on average) for one term. The student and faculty member must sign a form in which they agree on the type and amount of work to be done, and the form must be approved by the Course Director before the student will be allowed to enrol. Students may enrol in this course during any term, and there is no limit to the number of terms in which they are allowed to enrol. Students will not be allowed to enrol in a biology research practicum course with their Honours Thesis (BIOL 4000) supervisor during the same terms that they are enrolled in BIOL 4000 8.00. The course evaluation will be pass/fail only. Students will be required to obtain safety training, such as WHMIS, if appropriate to the type of research undertaken. The course is intended only for students in biology or biochemistry majors. In addition, students in biophysics, environmental biology, and environmental science--life science stream are eligible to enroll.

BIOL 4700 3.00 Current Topics in Environmental Biology

A review of recent advances in environmental biology with an emphasis on current research, experimental design and biological methods. Three lecture hours per week. One term. Three credits.

Prerequisites: SC/BIOL 2050 4.00 and SC/BIOL 2060 3.00.

Course Credit Exclusion:

Textbook: TBA

Grading: TBA

Course Offering: Winter

Course Director: TBA

Notes: Available only to upper-year students enrolled in an Honours program in Environmental Biology and Honours Environmental Science (Life Sciences Stream).

BIOL 4710 3.00 Integrative Environmental Physiology

This course explores the influence of the environment on the physiology of animals, from the gene level to the population level, with an emphasis on evolutionary adaptations. Experimental design and data analysis will be stressed. Three lecture hours per week. One term. Three credits.

Prerequisites: SC/BIOL 2030 4.00, and one of SC/BIOL 2070 4.00 or SC/BIOL 2050 4.00, and one of SC/BIOL 3170 3.00 or 3110 4.00 or 3060 4.00.

Course Credit Exclusion:

Textbook: TBA

Grading: 25% Midterm, 30% Final, 15% Activities and Assignments, 10% Presentations, 20% Written Paper

Course Offering: Winter

Course Director: Carol Bucking (cbucking@yorku.ca)

Notes:

BIOLOGY DEPARTMENT FACULTY LISTINGS

<u>Surname</u>	<u>First name</u>	<u>Building</u>	<u>Room</u>	<u>Tel. Ext.</u>	<u>Email</u>	<u>Title</u>
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York University Main Line : (416) 736 - 2100, for all above five digit extensions.