### Biology

#### Program Requirements
**M.Sc. Biology (5.0 credits)**

Requirements:  
1. 1.0 credit in approved coursework  
2. 4.0 credits in:  
   - BIOL 5909 [4.0] M.Sc. Thesis (including successful oral defence)  

Total Credits 5.0

**M.Sc. Biology with Collaborative Specialization in Biochemistry (5.0 credits)**

Requirements:  
1. 1.0 credits in:  
   - BIOL 5002 [0.5] Seminar in Biochemistry I  
   - BIOL 5004 [0.5] Advances in Applied Biochemistry  
2. 4.0 credits in:  

Total Credits 5.0

**M.Sc. Biology with Specialization in Bioinformatics (5.0 credits)**

Requirements:  
1. 1.0 credit in:  
   - BIOL 5515 [0.5] Bioinformatics  
   - BIOL 5517 [0.5] Bioinformatics Seminar  
2. 4.0 credits in:  

Total Credits 5.0

**Bioinformatics-Related Courses**

**Biology**
- BIOL 5105 (BIO 5302) Methods in Molecular Genetics  
- BIOL 5201 (BIO 8301) Evolutionary Bioinformatics  
- BIOL 5409 (BIO 5306) Modelling for Biologists  
- BIOL 5501 (BIO 8100) Directed Studies in Biology  
- BIOL 5502 (BIO 8102) Selected Topics in Biology  
- BIOL 5516 (BNF 5107) Applied Bioinformatics

**Biomedical Engineering**
- BIOM 5400 (BMG 5317) Medical Computing  
- BIOM 5405 (BMG 5111) Pattern Classification and Experiment Design

**Computer Science**
- COMP 5306 (CSI 5100) Data Integration  
- COMP 5307 (CSI 5101) Knowledge Representation  
- COMP 5704 (CSI 5131) Parallel Algorithms and Applications in Data Science  
- COMP 5703 (CSI 5163) Algorithm Analysis and Design

**Mathematics and Statistics**
- STAT 5708 (MAT 5170) Probability Theory I  
- STAT 5709 (MAT 5171) Probability Theory II  
- STAT 5703 (MAT 5181) Data Mining  
- STAT 5702 (MAT 5182) Modern Applied and Computational Statistics  
- STAT 5600 (MAT 5190) Mathematical Statistics I  
- STAT 5501 (MAT 5191) Mathematical Statistics II  
- MATH 6507 (MAT 5319) Topics in Probability

**Systems and Computer Engineering**
- SYSC 5104 (ELG 6114) Methodologies For Discrete-Event Modeling And Simulation  
- SYSC 5703 (ELG 6173) Integrated Database Systems

**M.Sc. Biology with Specialization in Chemical and Environmental Toxicology (5.0 credits)**

Requirements:  
1. 1.5 credits in:  
   - BIOL 6405/ CHEM 5805 [1.0] Seminar in Toxicology  
   - BIOL 6402/ CHEM 5705 [0.5] Principles of Toxicology  
   - or BIOL 6403/ CHEM 5708 [0.5] Ecotoxicology  
   - and 0.5 credit in additional approved coursework  
2. 3.5 credits in:  
   - BIOL 5909 [4.0] M.Sc. Thesis (including successful oral defence)  

Total Credits 5.0

**M.Sc. Biology with Specialization in Data Science (5.0 credits)**

Requirements:  
1. 0.5 credit in approved coursework  
2. 0.5 credit in:  
   - DATA 5000 [0.5] Data Science Seminar  
3. 4.0 credits in:  

Total Credits 5.0

**Note:**  
- Completion of the graduate courses specified by the student's advisory committee and the director or associate director of the OCIB is required. These are normally two one-term courses, but additional courses may be required, depending on the background and research program of the student.

COMP 5108 (CSI 5126) Algorithms in Bioinformatics

SYSC 5104 (ELG 6114) Methodologies For Discrete-Event Modeling And Simulation

SYSC 5703 (ELG 6173) Integrated Database Systems

MATH 6507 (MAT 5319) Topics in Probability
• The passing grade for all required courses is 70% or the equivalent, and the student is not allowed a supplemental examination.
• The admissions committee or the student's advisory committee may also direct the student to take or to audit additional courses. Knowledge of a second language may be specified as a requirement.
• Completion of at least two terms as a full-time student resident at one of the two universities is normally required. Programs for part-time students may be arranged.
• Presentation of one public seminar on the candidate's thesis research is required.
• Completion of a thesis incorporating the results of original research carried out under the direct supervision of an approved faculty member is required.
• Successful oral defence of the thesis before an examination board of at least four faculty members, normally drawn from both universities, is required.

Ph.D. Biology (10.0 credits)

Requirements:
1. 1.0 credit in approved coursework 1.0
2. 9.0 credits in:
   - BIOL 6909 [9.0] Ph.D. Thesis
Total Credits 10.0

Ph.D. Biology with Collaborative Specialization in Biochemistry (10.0 credits)

Requirements:
1. 1.0 credit in:
   - BIOL 6102 [0.5] Seminar in Biochemistry II
   - BIOL 5004 [0.5] Advances in Applied Biochemistry
2. 9.0 credits in:
   - BIOL 6909 [9.0] Ph.D. Thesis (in the specialization)
Total Credits 10.0

Ph.D. Biology with Specialization in Chemical and Environmental Toxicology (10.0 credits)

Requirements:
1. 1.5 credits in:
   - BIOL 6405/CHEM 5805 [1.0] Seminar in Toxicology
   - BIOL 6402/CHEM 5708 [0.5] Principles of Toxicology
   or BIOL 6403 [0.5] Ecotoxicology
   or CHEM 5705 [0.5] Ecotoxicology
   and 0.5 credit in additional coursework
2. 8.5 credits in:
   - BIOL 6909 [9.0] Ph.D. Thesis
Total Credits 10.0

Note:
• Completion of the graduate courses specified by the student's advisory committee and the director or associate director of the OCIB is required. These will normally be two one-term courses (four one-term courses if transferred to the Ph.D. program without completing the M.Sc.).
• Only graduate courses may form part of the candidate's course requirements.
• The passing grade for all required courses is 70%, and the student is not allowed a supplemental examination.
• The admissions committee or the student's advisory committee may also direct the student to take or to audit additional courses. Knowledge of a second language may be specified as a requirement.
• Scheduling of an oral Qualifying Examination within approximately 12 months of entry into the program and completion normally within 18 months is required; this examination will cover the candidate's area of research, and related topics. The format of the examination will be established by the departmental graduate committee. The examination committee generally will be composed of faculty members of both universities.
• Presentation of at least one public seminar on the candidate's thesis research is required.
• A thesis incorporating the results of original research carried out under the direct supervision of an approved faculty member is required.
• Completion of at least four terms as a full-time student resident at one of the two universities (or six terms if transferred from an M.Sc.) is required. Under exceptional conditions programs may be arranged for part-time students.
• Successful oral defence of the thesis is required before an examination board of at least five faculty members is required, with representation from both universities, and including an external examiner from outside the two universities who is an authority on the thesis research area.

Regulations
See the General Regulations section of this Calendar.

Guidelines for Completion of Master's Degree
The maximum time limits for the completion of the requirements of the master's program are listed in the General Regulations, Section 13 of this Calendar.

Full-time candidates in the master's program are expected to complete their degree requirements within six terms of first registration for full-time study.

Part-time candidates in the master's program are expected to complete their degree requirements within four calendar years or twelve terms from the initial registration in the master's program.

Regulations
See the General Regulations section of this Calendar.

Guidelines for Completion of the Doctoral Degree
The maximum time limits for the completion of the program requirements of the doctoral program are listed in the General Regulations, Section 13 of this Calendar.

Full-time candidates in the doctoral program are expected to schedule their oral Qualifying Examination within
approximately 12 months of entry into the program, and to complete it within 18 months of entry into the program.

Part-time candidates in the doctoral program are expected to schedule their oral Qualifying Examination within approximately 18 months after entry into the program.

Full-time candidates are expected to complete their degree requirements within four (4) calendar years or 12 terms of registered full-time study.

Doctoral candidates who have transferred from the master's to the doctoral program without completing the master's program are expected to complete their degree requirements within four (4) calendar years or 12 terms of registered full-time study from initial registration in the master's program.

Part-time candidates in the doctoral program are expected to complete their degree requirements within six (6) calendar years or 18 terms after the date of initial registration.

**Admission**

An Honours B.Sc. or equivalent degree at a standard acceptable to the two universities is required for admission to the M.Sc. program.

Applicants with acceptable standing in a non-honours degree may be admitted to a qualifying-year program which will be determined in each case by the admissions committee.

Applicants must demonstrate a fluent knowledge of English (Carleton), or either English or French (Ottawa).

**Admission**

An M.Sc. from a recognized university is required for entry to the Ph.D. program.

A student already registered for the M.Sc. may be permitted to transfer to the Ph.D. program following a recommendation by the departmental graduate committee and successful completion of the Qualifying Examination required of Ph.D. candidates.

All applicants must demonstrate a fluent knowledge of English (Carleton), or either English or French (Ottawa).