

BIOLOGY 4C12 Senior Thesis Regulations

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1. Preamble

The Department of Biology at McMaster University provides a research-intensive environment that offers a unique opportunity for students in all *Honours Biology and combined programs* to both participate in and contribute to the research of the faculty. Students participate in research while earning credits towards their degree through the 12-unit Senior Thesis (Biology 4C12). This is a two-term inquiry course that provides students an opportunity to conduct original research by collecting data and acquiring field and laboratory skills in biology under the supervision of a Full-time or Associate Member of the department. Upon successful completion of these courses, students should have demonstrated general proficiency in carrying out independent research; specifically, the students should have demonstrated the ability to:

- formulate a scientific hypothesis suitable for study
- design and conduct a project to support or refute the hypothesis, and
- analyze and present results in a thesis

In addition, thesis students are further challenged to present and defend their findings by giving a platform presentation at the end-of-term **Biology Undergraduate Symposium (BUS)**, to which supervisors, all faculty in the department and the general public are invited.

2. Eligibility of Students

- This thesis course is **ONLY** open to students registered in **Level IV of Honours Biology and combined programs**. It does not include students in other programs (most programs have their own thesis courses). This course is strongly recommended for students contemplating graduate work in Biology, or who are interested in pursuing a career in research of any kind.
- Students who wish to conduct research that does not explicitly involve hypotheses testing should register in **Biology 4F06**.
- This course takes place over two terms, usually the Fall and Winter terms. The time commitment a student needs to allocate to this course will vary with the project, supervisor and student. As a general rule of thumb, students should expect to spend a minimum of 18- 20 hours per week, with more time allocated to research early in the first term. It is not unusual for supervisors to require more than 20 hours per week, including time during evenings and weekends. Therefore, when interviewing prospective supervisors, students must clarify supervisor's expectations in regards to the amount of lab time they would like their students to devote to their thesis. In addition, it is **important to discuss with the supervisor and clarify the expectations** for each component of the course i.e. lab work, written components (research proposal, mid-year report, draft thesis, final thesis) and oral presentation at the Biology Undergraduate Symposium. In order to meet these expectations, enough time must therefore be devoted to the preparation of these assignments. In case of a disagreement between the supervisor and student, the course Coordinator will help in clarifying the rules on realistic expectations for the 4C12 course. Ideally, the experimental phase of the project should be completed by the end of February so that the remaining time in March can be devoted to analysis, writing and editing. All laboratory work should cease by mid-March to allow for two to three weeks for completion and submission of the thesis.
- It is important for both supervisors and students to agree on the topic of the research. In the past, some

thesis projects have been so experimentally complete, and so integral to the supervisor's research programs, that the results have been published and the students credited with authorship. At the other extreme, there are projects in which technical difficulties prevent the completion of planned experiments, and the results are ambiguous. In the latter situation a student may still earn an A range grade for his/her design and analysis, for suggesting and testing alternative experimental approaches to the problem, and for an overall understanding of the project. A high grade does not therefore necessarily depend upon collecting the hoped-for data, but comes from full and aggressive intellectual and physical involvement in attacking the problem.

3. Course Components and Grading Scheme

Students in the course are evaluated on the basis of five components:

Component	Weighting
Research proposal/literature review	10%
Mid-year report	15%
Written thesis	20%
Work performed to collect and analyze data (e.g. activities performed in the laboratory or in the field or using or generating data on computers)	35%
Platform presentation during the Biology Undergraduate Symposium	20%

Evaluation forms for each component of the course will be available on Avenue to Learn and must be submitted to the Supervisor/Co-Supervisor either electronically or as a hard copy, according to the preferences of members of the supervisory committee.

The research proposal/literature review is due usually mid-way during the first term, and is marked solely by the Supervisor. Please note, that students must also submit page 1 of the Research Proposal form electronically to the course Administrator for review by the course Coordinator (this page should also be included in the copy submitted to the Supervisor and Co-Supervisor). Page 1 is a summary of the Hypothesis, Objectives and Progress of the ongoing project.

The written mid-year progress report is due early in the second term, and is also marked by the supervisor alone. These components are intended to provide solid feedback to the students early in the project. Although both the proposal and the mid-year progress report are marked by the supervisor ALONE, copies of these should be provided to all members of the supervisory committee.

All laboratory experimentation or data analyses must be completed by the end of the second term, at which time the supervisor will assess the student's work during the two terms with respect to activities performed in the lab or in the field, data analysis and computation. The first draft of the thesis is usually submitted to the supervisory committee (see membership composition below) and graded by BOTH supervisor and co-supervisor. All members of the supervisory committee MUST also attend BUS to ask questions of the student, and to grade the student on this component. After the supervisory committee provides comments on the first draft of the thesis, the student must make the corrections and submit the final thesis in a pdf format to the Course Administrator. If permission is granted by the supervisor, the document will be posted on the web or else archived in electronic format by the department.

It is **important to meet all deadlines** as some components and, particularly, the presentation at the Biology Undergraduate Symposium, involve complex logistics in the organization of the event. **No extension will be granted.**

4. Project Selection

Students who wish to enroll in this course must seek the support of a supervisor. This can be a Full-time or Associate Member of the Biology department, a full time faculty member in another relevant department or a faculty member from off-campus. If you choose a supervisor who is not a member or associate member of Biology you must have a co-supervisor who is a Full-time member of the Biology department. There is a list of potential supervisors available on the Biology website but you are not limited to just them. Students should first select prospective supervisors to contact based on their general area of research interest. We recommend that students first contact the professor by email and then make an appointment to discuss potential projects and the general nature of the professor's research program. During this meeting, students should ask for clarification of the professor's expectations with respect to number of hours per week in the laboratory, and whether or not weekend and evening work is required or expected. It is also a good idea to talk to a prospective supervisor's current thesis students in advance of the meeting to gain some insight into his/her supervisory style. Discuss also with your supervisor whether a co-supervisor is required, whether you, as a student, would like to have a co-supervisor or if they would prefer to have one. The supervisor and co-supervisor (if there is one) constitutes the supervisory committee which will be responsible for grading your final written thesis and your BUS presentation, and for giving general guidance throughout the course. The permission form must be completed, signed by both the supervisor and co-supervisor (if there is one) and returned to the Course Administrator, LS-119, no later than **April 30**.

<http://www.biology.mcmaster.ca/undergraduate/permission-forms/>

If, after the start of the project, the student has the support of the supervisor to switch to the Biology 4F06 Project, a memorandum detailing the reasons for the request must be signed by the student and supervisory committee and submitted to the Course Coordinator for approval. Deadline for such requests will be **November 30 of the current academic year**. On a case-by-case basis, the Course Coordinator may approve a transfer at a later date.

5. Roles and Responsibilities

The Supervisory Committee

The **supervisory committee** consists of the 1) **supervisor**, who is either a Full-time faculty of the department of Biology or an Associate Member of the department with supervisory privileges, or a faculty member in another, relevant, department. 2) **co-supervisor**, is an option to be discussed with your supervisor, suggested by the supervisor and approached by the student. If the supervisor is a faculty researcher not affiliated with Biology then a co-supervisor is required and that person must be a Full-time Biology faculty member. The list of potential supervisors will be updated annually on the website. **Regardless of the supervisor's status, professors who are absent from the University for more than two weeks during either term will not be permitted to supervise students, unless alternate arrangements have been made to have a colleague, graduate student or post-doc to substitute during their absence and contact information of that person must be forwarded to the Course Administrator.** When appropriate, additional committee members outside of the department may be permitted to sit on the student's supervisory committee and requests of this nature will be subject to the final approval of the Course Coordinator.

Responsibilities of the Supervisor

Supervisors are responsible for the immediate direction and instruction of the student and should commit on average, a minimum of 30 minutes of contact time each week with the student. Supervisors will communicate their own expectations in terms of the day-to-day conduct of the student in the laboratory/clinic/field, as well as protocols used to track research progress and to collect data (i.e. use of lab note books, etc.). Since it is impractical to insist on a single format for all disciplines and project types, supervisors are responsible for setting guidelines and terms of reference for the research proposal or literature review for their own students. These should be provided to the students early in the first term. The supervisor should also provide regular oral or written feedback to the student in regards to level of productivity, and degree of satisfaction of the student's progress. **Students should be clear on what is expected of them throughout the course.**

All research conducted by students as part of their thesis must comply in spirit as well as in fact with the Tri-

Council Policy for Research Ethics. It is incumbent upon every supervisor to ensure that every student conducts work safely, and that all necessary equipment has been made available. All projects to be undertaken that may involve human participants must be subject to Research Ethics Screening. Supervisors must ensure that appropriate safety training has been taken by all students before they commence laboratory or field work. This includes at minimum taking **WHMIS 2015 training**, and completing all lab specific safety training. The student is responsible for bringing written confirmation of training dates and location of training to the Biology main office, LS-218 during the first full week of the school term in September.

It is important for supervisors to track the progress of the students regularly throughout the term, and to ensure that laboratory work does not continue beyond mid-March. In the event that experiments do not generate hoped-for results, the supervisor should not expect students to start anew on a different project in mid-course. It is the responsibility of the supervisor to ensure that students have sufficient time to complete their analysis, writing and editing of the first draft, in time for final submission of the thesis by mid-April. Therefore, as a general guideline, all laboratory work should cease by mid-March.

Clarifying the expectations for the Biology Undergraduate Symposium (BUS): No event is more stressful for students than the presentation at the Biology Undergraduate Symposium. **Supervisors must clarify the expectations for this presentation.** The Supervisor must emphasize proofreading and the importance of preparing the talk well ahead of the deadline. The Supervisor must also indicate to the student if he/she needs to preview/approve the oral presentation well ahead of the deadline for submission of the electronic file of the presentation. Again, this is necessary to ensure the efficient and timely organization of the Symposium.

Responsibilities of the Student

It is the responsibility of the student to keep the supervisory committee up-to-date throughout the year regarding progress on the project and any change in the project topic or proposal. We recommend that the **student organize a supervisory committee meeting** before handing in their Research Proposal to discuss the nature and scope of their project. During this meeting, the student should also request written guidelines and marking schemes for the research proposal, mid-year report, final thesis and the lab component of their grade. If appropriate, the student may request to see copies of theses completed by former thesis students. The grade sheet for both the Proposal and Mid-year Progress report must be signed by the student; this ensures that the student obtains appropriate feedback and is aware of the grade attained for each component. If the supervisor does not notify the student of his/her grade within one week of the due date for return of the grade sheet (see List of Important Dates), the student should inform the Course Administrator. A student can direct any issue of a scientific nature to the supervisory committee at any time; however, if conflicts arise that cannot be solved between the student and supervisory committee, it is the **responsibility and right** of the student to ask the Course Coordinator to intervene. Students must also discuss the expectations for each component of the course (lab work, written components and presentation at the Biology Undergraduate Symposium) with the supervisor.

Responsibilities of the Coordinator

There will be lecture/meetings scheduled throughout the two terms, during which all students in the course can meet with the Course Coordinator and Administrator to discuss various issues relating to deadlines, course requirements, etc and to get guidance on time-management and how to communicate effectively with your supervisory committee. The Course Coordinator can also provide individual counseling if problems cannot be solved between student and supervisor.

Ontario Biology Day Conference

This event is held annually in March at an Ontario university. Students are encouraged to make a platform presentation in this conference, as a dry-run for their BUS presentation. This conference also provides an excellent opportunity to meet fourth year Honours students and faculty from other universities throughout the province and to assess potential laboratories for graduate work.