

**BIOL 4100 - HONOURS THESIS COURSE OUTLINE
2021-2022**

CREDIT 6 hours (both terms)

PREREQUISITES BIOL 3100 and Fourth Year Honours status in Biological Sciences

HONOURS THESIS COMMITTEE (HTC)

CHAIR: Dr. Gordon Goldsborough, 204-474-7469, gordon.goldsborough@umanitoba.ca, BSB 314

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Dr. Jane Waterman, 204-272-1678, jane.waterman@umanitoba.ca

CLASS MEETINGS AND DEADLINES

There are no regular lectures or labs but the following general meetings and deadline are scheduled. Deadlines are for midnight on the day indicated.

| Important Dates | Dates |
|---|---|
| Research proposal due to Advisory Committee Summer Research Projects Regular Session Research Projects | Before 31 May 2021 Before 17 September 2021 |
| BIOL 4100 Information Session / Student Mixer | November 2021 (tentative) |
| Progress Report draft due to Advisor Progress Report due to Advisory Committee Advisory Committee Meeting | 3 December 2021 7 January 2022 Before 28 January 2022 |
| Final Thesis draft due to Advisor Final Thesis due to Advisory Committee Final Thesis with all corrections to Department office | 7 March 2022 28 March 2022 22 April 2022 |
| Honours Thesis Symposium | mid-April 2021 (tentative) |

Important Note on Deadlines. Once set by the HTC, report deadlines and the thesis symposium dates are final. Extensions will only be granted by the Chair due to extenuating circumstance (i.e., medical illness) and will require appropriate documentation. If the student or advisor foresee a conflict with the above deadlines, the HTC Chair should be contacted as soon as possible so that appropriate accommodations can be made. In addition to the committee members, copies of the documents should be submitted to the HTC Chair so that submission can be confirmed.

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In addition to the final thesis oral defence, each student must present two oral reports on their written documents for their Advisory Committee (see below for description). Students and committee members will be in attendance and the oral presentation and report will be evaluated by each committee member.

1. *Research Project Meeting.* The student will present the research proposal orally for discussion and approval by the Advisory Committee. Although not mandatory, it is generally in the student's best interest to have the proposal meeting completed before commencing research. However, if this is not possible, you should contact the HTC Chair in advance of the deadline. Contact the HTC Chair as soon as possible if you, or your advisor, have questions or will have difficulty meeting the above deadlines. Copies of the proposal document must be submitted to each member of the Advisory Committee at least seven days prior to the proposal meeting. These copies may be electronic or printed, depending on the preference of committee members. An electronic copy **MUST** also be provided to the HTC Chair on this same date.
2. *Progress Report Meeting.* The student will present orally a progress report for discussion and review (see below). A first draft of the progress report should be given to your advisor(s). A copy of the final written progress report must be submitted to each Advisory Committee member with an electronic copy sent to the HTC Chair.

A first draft of the thesis document should be given to your advisor(s) and a revised version should be submitted to all members of the Advisory Committee for grading. A final corrected copy of the thesis for the Department's archives should be submitted to the Biological Sciences General Office.^a

COURSE CONTENT AND PROCEDURES

The course is designed to give Honours students experience in scientific research, from the inception and planning stages through experimental execution, data analysis, written reporting and oral communication.

Communication. The primary form of communication between students and their committee and the chair of this course is through email and the student's myumanitoba account. It is expected that students will check this account regularly for updates. Under normal circumstances, students will be asked to respond to HTC Chair or advisor emails within two business days. Regular in-person meetings between the advisor and student should be arranged according to mutually agreeable times. Failure of the student to attend these meetings without just cause will be brought under review by the HTC Chair and Advisory Committee and may be reflected in the final grade assignments for the course.

Advisor. Each student will be responsible for finding an advisor from among the regular faculty members of the Department of Biological Sciences who is willing and able to supervise the research project and provide facilities/resources for it. Adjunct members of the Department may advise BIOL 4100 students but are required to have their adjunct status confirmed (via email from adjunct committee) prior to acting as an advisor. Co-advisors from outside the Department may be acceptable; however, this will also require a co-advisor from the regular faculty members of the Department. In addition, the co-advisor will be responsible for ensuring the student's activities are consistent with expectations of BIOL 4100. If a non-department co-advisor is desired, the student must first consult with

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the HTC Chair to seek approval of that co-advisors. *Note:* When there are co-advisors, each has equal stature for assigning grades on the Advisory Committee, and together they count as a single vote.

The HTC will review case by case requests from scientists with term positions who are not tenured/tenure-track faculty (such as postdoctoral fellows or research associates) wishing to co-advise honours students or be considered as an additional (arms-length) member of the Advisory Committee. In successful cases, the other co-advisor must be selected from the regular faculty members of the Department of Biological Sciences.

Advisory Committee. An Advisory Committee consisting of the advisor (and co-advisor if required), one HTC member, and one additional external committee member will be set up for each student, to give advice and assess progress. *Note:* The student and/or the student's advisor must identify and contact the additional committee member well in advance (by mid-April or mid-August) of the proposal meeting. It is the responsibility of the student to provide the Advisor's and committee member's name and contact information to the HTC Chair. The HTC member of the committee will be assigned by the HTC Chair.

The experimental part of the project may be carried out during the fall term of the fourth (or fifth) year or during the preceding summer. Students may also use data gathered during summer employment outside the Department, provided that both the employer and the student's thesis advisor(s) agree in writing beforehand to the student's use of these data. Non-experimental projects involving either the original compilation and analysis of existing data or the theoretical exploration of a problem (e.g., model development) may also be acceptable. Please contact the HTC Chair for permission.

Information. In the spring term (February or March), the HTC will hold an information meeting with students interesting in taking the Honours Thesis course in the following academic year. This orientation will provide information on course requirements and procedures, and will help students to contact possible advisors, if they have not already done so.

Research proposal and review. In consultation with the advisor(s), each student will prepare a written research proposal, ideally before starting a project, and will distribute this proposal to the Advisory Committee. At the subsequent proposal review meeting, the student will present the proposal orally (see guidelines below) to the Advisory Committee, who will discuss it and possibly suggest modifications. The amended proposal will become the student's research plan. For students intending to carry out summer research projects, the Advisory Committee should be in place, and the proposal prepared and reviewed, and presented orally. Students intending to do Fall research projects should have proposals ready for review by their Advisory Committees before the beginning of the Fall Term to facilitate organizing the proposal meeting before the Fall deadline.

Progress Report. Each student will submit a written progress report by which time data collection should be done or close to completion. The written report will be reviewed before the end of the exam period.

In the event that a student's progress is judged to be unsatisfactory, an early meeting of the Advisory Committee and the student will be called and if there is no reasonable way to get the project back on track so it can be finished on time, the student will be asked to withdraw from the course. The student could then graduate with a BSc (Major) upon successful completion of six hours of credit from courses

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acceptable for the Major Program in addition to the remainder of the courses in the original Honours Program. Likewise, if either the research proposal or the progress report is not submitted by the due date, nor within a reasonable time thereafter following a reminder from the Advisory Committee, the student will be required to withdraw from the course.

Assuming sufficient demonstrable progress in the written report, the oral presentation of the progress report will be scheduled. Typically meetings will occur following the December break. If a student would prefer to complete the progress report meeting before the December break, and the Advisory Committee is available, the student may request a meeting in December; however, it is recommended that the student plans for this early and submits the request to the HTC Chair well before the December deadline.

Thesis. The thesis should be written in accordance with the guidelines given below. All theses will be orally examined and defended at the Honours Thesis Symposium to be held before the beginning of final examinations in the Spring Term in April.

Oral Thesis Examination (defence). The Thesis Examination Committee will consist of a Chair (one member of the HTC or departmental designate) and three examiners: the advisor(s), a member of the HTC, and an additional committee member. Two of the three examiners must be regular faculty members in the Department of Biological Sciences. At the defence, the student should present a summary of the thesis and its findings in a twelve-minute talk. After the oral presentation, each student will be questioned orally on the thesis for about five to ten minutes by each examiner. Each examiner will independently evaluate the written thesis, the oral presentation and the student's responses to examiners' questions.

Departmental thesis copy. The examining committee will agree upon any final editorial corrections that the student should make to the submitted thesis document. Major substantive changes are not permitted at this stage. One final corrected copy of the thesis should then be submitted to the course coordinators after the spring examination period. This copy will be bound by the Department and be made available to interested readers.

GRADING

The course grade for each student will be assigned on the basis of evaluations from the student's advisor(s) and Advisory Committee or Thesis Examination Committee members. Marks will be given for:

1. The research proposal (including oral presentation) 10%
2. The progress report (including oral presentation) 15%
3. The conduct of the research (evaluated by the advisor(s) only) 15%
4. The thesis as a written document 50%
5. The oral thesis presentation 5%
6. The oral thesis examination 5%

Late research proposals, progress reports and theses will lose 20% of possible grades per day if not submitted to their committee seven days in advance of a meeting (proposal) or deadline (progress

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report and thesis). This will only affect the written portion of the research proposal, progress report, and thesis.

Note: All marks with the exemption of item #3 are evaluated by each member of the Thesis Examination Committee. Resultant values will be a mean of the marks submitted by each of these committee members. The written proposal, progress report, research conduct, thesis document, oral thesis presentation and examination will be evaluated by both advisor and co-advisor, and their grades will be averaged. In the event of an advisor being unable to attend the oral defence of the thesis research, the co-advisor will submit that portion of the grade.

Midterm evaluation: Students will receive written evaluations with assigned marks from their Advisory Committees after both the research proposal review meeting and the progress report review meeting.

Copyright, Plagiarism and cheating: Students should be careful to attribute properly the sources of ideas and information used in their written and oral presentations. Plagiarism carries severe penalties. See relevant discussion in the University of Manitoba Undergraduate Calendar. Figures submitted in the published final thesis are subject to copyright. Copyright permission must be obtained and cited appropriately in the thesis when figures under copyright are used. If you are unsure about the copyright status of a figure consult the course chair or your advisor. Resources are available in the university library to assist you in obtaining copyright where necessary. Students uncertain as to what constitutes plagiarism should consult their advisors or other staff members. *Note:* In cases where students have prepared written reports for other courses on a similar research topic (e.g., BIOL 3100), they are not allowed to resubmit this work in its original form (this is called “duplicate submission” and is outlined under Cheating, Plagiarism and Fraud according to the following:

http://www.umanitoba.ca/student/resource/student_advocacy/cheating_plagiarism_fraud.html

GUIDELINES FOR WRITING THE RESEARCH PROPOSAL

The Honours Thesis research proposal should be no more than six to twelve written pages in length (excluding figures and tables) and be double-spaced. The following points should be covered, preferably in the order given. These do not represent required section headings for your proposal, however. Before you begin to write, you should consult with your advisor to determine if all of these points are relevant to your proposal and if there are any additional items that should be included.

Introduction (2–3 pages)

- summarize the literature background and context of your proposed research; i.e., what is known about the topic
- cite only the most relevant literature to justify your research question (i.e., this should not be an exhaustive review which is more appropriate for the final thesis document)
- describe the relevance of the proposed research to your field of inquiry
- explicitly state your research objectives or question(s), possibly recasting as a *testable* hypothesis

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Proposed Research Activities (4–9 pages)

- this is the main body of your proposal
- the material presented here will provide the focus for discussion during your proposal review

This section will form the basis for the Materials and Methods section of your final thesis document and should include details about the:

i) Study design

- how will your study organisms be obtained and/or maintained?
- apparatus – how will your equipment and experiments be set up? (include figures if applicable)
- field site description (if applicable)
- pertinent Animal Care Protocols and collection permits (if required).

ii) Experimental protocol

- what is your experimental unit?
- what traits or variables will be measured?
- how will measurements be made? (include modifications to published techniques)
- what control observations will be made?
- how many treatments / replicates / samples will be measured, and in what order?

iii) Data presentation and processing (tables and other formats)

- how do you plan to present your data at the end of your field work / experiment?
- what mathematical transformations or formulae will you apply, and why?

iv) Proposed statistical analysis

- which tests will be performed and why?
- statistical considerations (e.g. power, number of replicates).

Literature Cited

- the style adopted by the *Canadian Journal of Zoology* or *Botany* will be the accepted standard (see “Instructions to Authors” on the journal webpages). Please be consistent.

GUIDELINES FOR WRITING THE PROGRESS REPORT

The written progress report should concisely describe and analyze the scientific findings of the project to date for the Advisory Committee. A suitable outline should include:

1. Introduction (more thorough and comprehensive than in the proposal document)
2. Research objectives and hypothesis

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3. Methods and Materials (should be nearly complete; describe any problems encountered together with detailed modifications from the original proposal).
4. Results (brief summary of your analyzed data; you should make reference to tables and figures here). This section should include tables and graphs of the results
5. *Preliminary* Discussion, including comparisons with published literature
6. Outlook and *timeline* (can be in table format) for successful completion of project
7. Literature cited
8. Appendix if required

This report should emphasize mainly the results obtained in the various experiments, wherever possible through a preliminary graphical or tabular presentation of data and some assessment of their statistical significance. This presentation should be integrated with a brief discussion comparing the results obtained with the outcomes expected on the basis of relevant literature. The adequacy of the experimental design should be assessed, on the basis of the experience gained. Any difficulties experienced with particular experiments should be described, and their implications for the project's successful completion should be explained.

GUIDELINES FOR WRITING THE THESIS

The thesis format should follow the University of Manitoba graduate thesis. It should begin with:

1. A title page (not numbered), as follows:

Title of the thesis

by

Author's Name

A thesis submitted to the Department of Biological Sciences, University of Manitoba,
in partial fulfilment of the requirements for the course

BIOL 4100 (Honours Thesis)

for the degree of

Bachelor of Science (Honours)

©Month, year

2. An abstract of 200 to 300 words summarizing the problem, methods, results and conclusions (numbered page i - sequential small Roman numerals follow)
3. Acknowledgements (page ii) – submitted only in the final (post-defence) thesis version
4. Table of Contents (beginning on a new page)
5. List of Tables (beginning on a new page, see note regarding placement of Tables)
6. List of Figures (beginning on a new page, see note regarding placement of Figures)

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This should be followed by the main body of the thesis. Text should be 12 point font and double-spaced (no more than three lines per inch). Figure legends, tables and references may be single-spaced; references should then be separated by a blank line. Margins should be 2.5 cm at the top, bottom and right-hand edges of the page, and 3.75 cm at the left to allow for binding.

7. Introduction (beginning on page one, sequential Arabic numerals thereafter), outlining questions and hypotheses addressed, in the context of all relevant literature.

8. Materials and Methods

9. Results

10. Discussion

11. Literature Cited

The style adopted by the journals *Canadian Journal of Zoology* or *Botany* (links below) will be the accepted standard. *Note:* The student, on request of the advisor, may prepare the thesis to conform to a different format, used by another refereed journal in the discipline of the thesis. In this case, the format should be identified in advance and made available to the student's Thesis Examination Committee.

<https://cdnsiencepub.com/journal/cjz/authors>

<https://cdnsiencepub.com/journal/cjb/authors>

Tables and Figures may be either:

a) Placed at the end of the thesis after the Literature cited **or**

b) Integrated into the body of the thesis.

Large figures should be placed on separate pages in the text just after each is first cited. The figure legend may be printed below the figure on the same page (this page would be numbered sequentially with the text), or the legend may be placed on the preceding page facing the figure (in this case, the page with the legend receives a number but the page with the figure does not). Smaller figures might be inserted in the running text. Tables should likewise be interleaved and paginated in sequence with the text after they are first cited.

Students should consult with their Advisory Committee regarding placement of tables and figures.

12. Appendices (if necessary)

In case of other questions regarding format, the course coordinators may be consulted. Alternatively recent Honours Theses may be used as guides. There is no set minimum/maximum limits on thesis length. However, past documents have typically ranged in length from 30 to 80 pages (main body, including figures, tables and references). Keep in mind that length is not an indicator of quality and concise, well-written documents will make it much easier for your committee to appreciate the significance of your findings.

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GUIDELINES FOR ORAL PRESENTATIONS

The following guidelines refer specifically to the three oral presentations in the Honours Thesis course. The goal of these presentations is to summarize your research plans or results prior to discussion and to provide visual aids to assist that discussion. The presentation should be concise and approximately twelve minutes in duration for the research proposal and progress report, and no more than twelve minutes in duration for the thesis defence. It is important to discriminate between essential and nonessential information in preparing formal presentations with strict time limits. Though you should focus on your own research plans or results, you should remember that the course coordinators sitting on your Advisory Committee are probably initially unfamiliar with your specific field of research.

The following is a suggestion on how to organize your oral presentations:

1. Allow one to two minutes for each visual aid presented.
2. The first visual should have your name and the title of your research project.
3. The second visual is optional and may contain a general outline of your presentation and provide a 'road-map' of what you will present.
4. The next visual contains the background material and the research question(s) being posed.
5. The remaining visuals should deal with:
 - the details of research materials and design (for the research proposal)
 - the results obtained (for the progress report and thesis defence) and
 - the conclusions drawn from the results (for the defence).
6. Text visuals should:
 - be in large type (24-point or greater) or neatly hand written; avoid 'fancy' fonts and distracting animations
 - contain no more than 15 lines per page (preferably less)
 - be formatted as an outline or as complete but distinct sentences (no paragraphs).
7. Table visuals should:
 - have columns and rows clearly labelled (include sample sizes and statistical analysis where appropriate)
 - indicate (throughout the presentation) how the data relate to the experimental design.
8. Figure visuals should:
 - indicate expected or observed relationships
 - have axes and measurement units clearly labelled (include sample sizes and statistical relationships where appropriate).

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9. Diagrams, maps and images should:

- be clearly labelled to indicate features relevant to your research
- include an indication of scale.

Note: It must be clear that you understand the background of your proposed study and the methods/experimental design you intend to use. Make sure that you understand the given time-frame of the study and the overall feasibility of the project.

AWARDS AND BURSARIES FOR OUTSTANDING HONOURS WORK

Note: Awards are subject to availability and the candidates meeting the eligibility criteria of the award. The monetary amount awarded is subject to change each year. Award candidates will be contacted by Financial Aid and Awards directly.

Shirley Ann Akins Undergraduate Thesis Proposal Prize

Due to Chair: 17 September 2021

Up to three awards of \$500 to 750 each will be awarded to the top applicants. Applicants must be enrolled in BIOL 4100 and will be required to submit an electronic application to the HTC Chair. Successful applicants will be contacted by Financial Aid and Awards directly upon confirmation of award eligibility.

The application should include a summary of the Honours research proposal (maximum 500 words) written exclusively by the student. A signed note from the thesis supervisor confirming that the student has written the proposal summary without input from the supervisor.

Dr. Lane Graham Prize for Best Honours Thesis

An annual \$1,375 award for the best honours thesis, which is decided by the HTC after the final oral defense. Upon his retirement from the Department of Biological Sciences, Dr. Graham set up an endowment to support this award. Dr. Graham came to the University of Manitoba in 1970 and taught Introductory Biology, Invertebrate Zoology, and Parasitology. He always considered the Honours Thesis to be an important component in the training of a scientist in Biology, and felt strongly that the best and brightest young students should be recognized for their achievements.

The Ronald K. Stewart-Hay Memorial Bursary

Due to Financial Aid & Awards: 1 October 2021

Award of \$4,500 available for students who have completed year three of study in BSc Honours and are currently enrolled full time in the Honours program. It requires demonstrated academic excellence (no minimum GPA cut-off) and demonstrated financial need. Applications are to be submitted to Financial Aid and Awards in Aurora Student.