

NEURO 498/499: HONOURS RESEARCH PROJECT IN NEUROSCIENCE

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Neuro 498/499- Important times/deadlines

Neuro 498

- September 1, 2022:** Fall term classes begin
- September 2, 2022:** Deadline for submission of registration form to nmhi@ualberta.ca
- September 9, 2022:** Workshop (4-6 PM, RTF-3103)
- October 7, 2022:** Deadline for selection of oral presentations dates and times - coordinate with Amber
- November 18, 2022:** Deadline for submission of thesis proposal to the course coordinators Drs. Fujiwara and Wille (efujiwara@ualberta.ca & wille@ualberta.ca) by 12:00 noon.
- December 5-9, 2022:** Final oral presentations and exams (RTF-3103)

Neuro 499

- February 10, 2023:** Workshop (4-5 PM, **location TBD**)
- March 24, 2023:** Deadline for submission of thesis to the course coordinators Drs. Fujiwara and Wille (efujiwara@ualberta.ca & wille@ualberta.ca) by 12:00 noon.
- April 3-6, 2023:** Final oral presentations and exams (RTF-3103)

GENERAL CONSIDERATIONS

Students taking NEURO 498/499 and their supervisors are asked to please review the following guidelines to understand the expectations of these courses. This document also provides general guidelines for preparing written documents (for students) and for evaluating students' performances (for supervisors). Your cooperation will help to establish reasonably uniform standards of evaluation among different supervisors.

Course Description: these are Neuroscience courses restricted to students in the fourth year of the Honors program in Neuroscience. Both courses are taken in conjunction. Upon satisfactory progress in first-term NEURO 498, students will continue NEURO 499 in the winter term.

Course Objectives: The primary objective of NEURO 498/499 is to provide students with intense training in laboratory research and experimental neuroscience. Students will perform directed research in the laboratory of a faculty member from the Neuroscience and Mental Health Institute (NMHI). Students will be involved in the complete process of scientific research: formulation of the scientific question and hypothesis, acquaintance of background information and reference management, planning and performing experimental work, and presenting results orally and in a written thesis.

REGISTRATION: This course is not open for Bear Tracks registration. In order to register follow these steps.

1- The student should find and secure a supervisor: this is the most important step since the course involves working in an independent laboratory that belongs to the NMHI. The supervisor must be affiliated to the NMHI. The supervisor must provide the student with a scientific question that can be addressed and developed as a thesis proposal during Neuro 498 and tested experimentally during Neuro 498 and Neuro 499. Please notice that the list of potential supervisors posted in our website is not exclusive and other researchers who are not in the list will take students in their labs.

2- **Ethics and biosafety requirements**

Human/Animal ethics approval, as required for the project, **MUST BE IN PLACE** at the time of registration. Supervisors and students must take this into account when designing a project for these courses.

Laboratory and project-specific **biosafety training** must be provided to the student by the supervisor or any other qualified member of the supervisor's laboratory at the beginning of the course and prior to starting wet laboratory work, if applicable.

3- Submit the registration form electronically to course administrator, Ms. Amber Lapointe at nmhi@ualberta.ca by **September 2, 2022**. Electronic registration forms are available on our website or can be requested at nmhi@ualberta.ca.

Important: registration will not proceed without evidence of the following:

- Confirmation that the students have been added to the lab's EHS ARISE database.
- A brief plan of action signed by both the student and supervisor in the event no laboratory work can be continued in case of renewed COVID restrictions.
- Confirmation of up to date Animal License and/or Human Ethics License. If license expiration date precedes date of project completion, proof of renewal should be provided at the appropriate time.

Booking Oral Presentation Dates and Times for Neuro 498 and Neuro 499

Oral presentations are evaluated by the supervisor, an external expert faculty member and the course coordinators. The selection of the external expert faculty member is the responsibility of the supervisor. **The external examiner must not be a co-supervisor of the project nor be involved in the project in any other form.** All considerations should be taken to secure the same faculty for NEURO 498 and NEURO 499. Please make sure that the supervisor (and co-supervisor when applicable) and external examiners will be available for the final exam in April 2023.

The student, in consultation with the supervisor (and co-supervisor if applicable) and the external examiner must select a date and time for Neuro 498 AND Neuro 499 examinations. Neuro 498 oral presentations will take place on a day of the week **December 5-9, 2022**. The final oral presentations for Neuro 499 will take place on a day of the week **April 3-6, 2023**. Please make sure that the supervisor (and co-supervisor when applicable) and external examiners will be available for **BOTH** exams times. For available dates and times please contact Ms. Amber Lapointe at nmhi@ualberta.ca. The deadline for selecting and securing exams dates and times is **Friday, October 7, 2022**.

Based on experiences during the 2020-2021 year the NEURO 498 and NEURO 499 exams can either be scheduled to take place in person or via Zoom, depending on the situation and the preference of the participants.

NEURO 498

Course Objective: The main objective of Neuro 498 is to develop and defend a thesis proposal based on one or two scientific questions suggested by the supervisor. The supervisor (or designated project lead) will guide the student through the complete process of scientific research: formulation of the scientific question and hypothesis, acquaintance of background information and reference management, planning and performing experimental work, and presenting results orally and in a written report. The student may perform experimental work during this term.

Course Format: The course comprises:

I: **Workshop on September 9 at 4:00-6:00 PM in person**, RTF-3103. This workshop will address the mechanics of hypothesis formulation, background acquisition, and references selection and management. It will discuss general guidelines for writing a thesis proposal.

II: **Research performed in the selected laboratory.** Includes the writing of the thesis proposal and performing experiments.

III: **Thesis proposal:** Students will write a thesis proposal document and submit it to the course coordinators Drs. Fujiwara and Wille (efujiwara@ualberta.ca & wille@ualberta.ca) **by 12:00 noon on November 18, 2022.**

IV: **Oral Presentation and Exam.** Students are required to make a 15 minute oral presentation of the thesis proposal and to defend it in front of an examining committee. Exams will take place the week of **December 5-9, 2022 in person, location TBD.**

Methods of evaluation: The final grade for the course are on a 4-point scale, defined in **Appendix 6** and will be determined from the aggregate marks obtained from the laboratory performance, written report and oral presentation each weighed as follows:

Laboratory performance mark (supervisor-assigned)	20%
Written report: (average of supervisor's, second examiner's and reader's marks)	40%
Oral presentation: average of supervisor's, second examiner's and course coordinator's marks.....	40%

Laboratory Performance (20%):

Students enrolled in NEURO 498 are expected to spend a **minimum of 20 hours/week** working in the lab of their supervisor. This time should be dedicated specifically to reading literature relevant to the particular project (not reading the news or watching videos on YouTube), writing the thesis proposal and/or performing experimental work. How this time is allotted during the week is up to the discretion of the student and supervisor. It is important to understand that most projects may require a higher number of dedicated hours per week, as well as a considerable degree of flexibility from the student to adapt to laboratory dynamics and experimental requirements. **Students must discuss with their potential supervisor their project and to agree on the specific time commitment required.**

Students will begin experiments to answer their research question(s). This experimental plan will continue in NEURO 499. Students should understand and learn the details of the experimental procedures and techniques they use in their project. They are also expected to acquire good practices for data recording and storage and to be involved in data interpretation.

The student's lab performance will be assessed by the supervisor and/or a designated member of the supervisor's lab (research associate, PDF) with whom the student would be working. Factors to be considered will include: (i) attendance, engagement, diligence and participation in the lab; (ii) aptitude for searching and understanding the literature; (iii) aptitude for team work, (iv) response to training in experimental techniques; (v) accuracy in experimental techniques, (vi) organizational and problem solving skills; vii contribution to data interpretation/ability to independently interpret data); and (vii) compliance with the safety and ethics guidelines outlined below in **Appendix 3.**

Written Report- Thesis Proposal Document (40%)

Students will write a thesis proposal document. This document should indicate that the student: (i) is familiar with the literature pertinent to the scientific question s/he will investigate, (ii) knows how to formulate a hypothesis based on existing evidence, and (iii) is able to design an experimental plan (in conjunction with their supervisor) to test that hypothesis.

Some guidelines for the preparation of the thesis proposal are listed in **Appendix 1**. The supervisor may choose to adapt the thesis organization to fit better their field of research. The length and font cannot be changed.

Students should submit the thesis proposal to the course coordinators Drs. Fujiwara and Wille (efujiwara@ualberta.ca & wille@ualberta.ca) **by 12:00 noon on November 18, 2022**. The course coordinators will distribute the document to the supervisor (and co-supervisor when applicable), an external expert examiner, and a reader (if required).

Supervisors are encouraged to provide students with suggestions on the structure and the content of the thesis proposal, and to revise preliminary drafts, but should not contribute significantly to the final document.

Oral Presentation and Exam (40%)

Students are required to make an oral presentation of the thesis proposal and to defend it in front of an examining committee composed by the supervisor (and co-supervisor when applicable), an external expert faculty and the course coordinators.

Students will prepare an oral presentation on their thesis proposal. The presentation must be no more than 15 minutes long. The presentation should include background information on the research topic identifying the gaps in knowledge that needs to be filled and/or the problem that needs to be solved. It should present a rationale for the study and propose one or more hypotheses. The student should present the goals and research objectives of the study, highlighting the original contributions of his/her study by explaining how his/her research questions or approaches are different from previous research. The student should propose experiments to test the hypotheses and indicate how the data will be analyzed. The presentation should include the significance of the work proposed.

The presentation will be followed by questioning from the committee members. Students will be expected to demonstrate knowledge of the general background literature relevant to their particular research topic, the rationale for their hypothesis, and details and soundness of the experimental approaches proposed. They must show an appreciation of good experimental design and be aware of the technical difficulties and pitfalls inherent to the chosen methodology. They should be able to discuss the significance of their project.

After the presentation, there will be some time so that feedback concerning the student's performance at the oral exam can be provided. In addition, at a separate time that is convenient for both, the supervisor and the student are encouraged to meet formally. In particular, the supervisor should point out the strengths and weaknesses of the student's oral presentation and written report, as discussed by the examining committee.

Selection of external examiner: **The selection of the external expert faculty member is the responsibility of the supervisor. The external examiner must not be a co-supervisor of the project nor be involved in the project in any other form. All considerations should be taken to secure the same faculty for NEURO 498 and NEURO 499. Please make sure that the supervisor (and co-supervisor when applicable) and external examiners will be available for the final exam in April 2023. A reader might be selected by the course coordinators.** The supervisor (and co-supervisor when applicable), the external examiner and the reader should read and mark the report before the oral examination takes place.

Selection of oral presentations dates and times (to be done in October): The student, in consultation with the supervisor (and co-supervisor if applicable) and the external examiner must select a date and time for Neuro 498 AND Neuro 499 examinations. Neuro 498 oral presentations will take place on a day of the week **December 5-9, 2022**. The final exam for Neuro 499 will take place on a day of the week **April 3-6, 2023**. Please make sure that the supervisor (and co-supervisor when applicable) and external examiners will be available for **BOTH** exams times. For available dates and times please contact Ms. Amber Lapointe at nmhi@ualberta.ca. The deadline for selecting and securing exams dates and times is **Friday, October 7, 2022**.

NEURO 499

Course Objective: The main objective of Neuro 499 is to perform experiments to test the hypothesis formulated during Neuro 498 and write and defend a thesis based on the experimental work performed during both semesters. The supervisor (or designated project lead) will analyze together with the student the raw data providing guidance of how to achieve results from these raw data, highlighting the most appropriate ways to present the result, how to perform statistical analysis, etc. They will also discuss the implications of the results, the potential pitfalls and alternatives and the overall significance of the work performed by the student.

Course Format

In addition to the research performed in the selected laboratory, the course comprises one 90 min. workshop led by the course coordinators. The workshop will take place on a date to be announced. It will discuss general guidelines for writing the honours thesis.

Course Format: The course comprises:

I: **Workshop on February 10, 2023 at 4:00-5:00 PM (location TBD).** This workshop, led by the course coordinators, will discuss general guidelines for writing a thesis.

II: **Research performed in the selected laboratory.** Includes performing experiments and writing the thesis.

III: **Honours Thesis Document:** Students will write a thesis document and submit it to the course coordinators Drs. Fujiwara and Wille (wille@ualberta.ca & efujiwara@ualberta.ca) **by 12:00 noon on March 24, 2023.**

IV: **Oral Presentation and Exam.** Students are required to make an oral presentation in front of an examining committee. The oral presentation will have two components: (i) **Three Minute Thesis (3MT)** and (ii) **honours thesis presentation.** Oral presentations will take place the week of **April 3-6, 2023 in person, RTF-3103.**

Methods of evaluation: The final grade for the course are on a 4-point scale, defined in **Appendix 6** and will be determined from the aggregate marks obtained from the laboratory performance, written report and oral presentation each weighed as follows:

Laboratory performance mark (supervisor-assigned)	20%
Written report: (average of supervisor's, second examiner's and reader's mar.....	40%
Oral presentation: average of supervisor's, second examiner's and course coordinator's marks.....	40%

Laboratory Performance (20%):

Students enrolled in NEURO 499 are expected to spend a minimum of 20 hours/week working in the lab of their supervisor. This time should be dedicated specifically to performing experimental work, reading literature relevant to the particular project (not reading the news or watching videos on YouTube), and/or writing the thesis. How this time is allotted during the week is up to the discretion of the student and supervisor. It is important to understand that most projects may require a higher number of dedicated hours per week, as well as a considerable degree of flexibility from the student to adapt to laboratory dynamics and experimental requirements. **Students must discuss with their potential supervisor their project and to agree on the specific time commitment required.**

Students will continue the experiments they started during the fall term (NEURO 498), analyze their results and reach their conclusions.

The student's lab performance will be assessed by the supervisor and/or a designated member of the supervisor's lab (research associate, PDF) with whom the student would be working. Factors to be considered will include: (i) attendance, engagement, diligence and participation in the lab; (ii) aptitude for searching and understanding the literature; (iii) aptitude for team work, (iv) response to training in experimental techniques; (v) accuracy in experimental techniques, (vi) organizational and problem solving skills; (vii) contribution to data

interpretation/ability to independently interpret data); and (viii) compliance with the safety and ethics guidelines outlined below in **Appendix 3**.

Written Report- Honours Thesis Document (40%)

Students will produce a written honours thesis on their project. This document should demonstrate that the student: (i) has performed experiments to test the hypothesis proposed during Neuro 498, (ii) knows how to present the results, (iii) is able to find major patterns in the observations, highlighting relationships, trends and generalizations among the results, (iv) is able to interpret the results in terms of their relationship with the original question design and whether they are in agreement or disagreement with previous work, and (v) is able to highlight the significance of the results.

Some guidelines for the preparation of the thesis proposal are listed in **Appendix 2**. The supervisor may choose to adapt the thesis organization to fit better their field of research. The length and font cannot be changed.

Students should submit the thesis to the course coordinators Drs. Fujiwara and Wille (efujiwara@ualberta.ca & wille@ualberta.ca) **on March 24, 2023**. The course coordinators will distribute the document to the supervisor (and co-supervisor when applicable), an external expert examiner, and a reader (if required).

The supervisor (and co-supervisor when applicable), the external examiner and the reader (if required) will read and mark the report before the oral examination takes place.

Supervisors are encouraged to provide students with suggestions on the structure and the content of the thesis and to revise preliminary drafts, but should not contribute significantly to the final document.

Oral Presentation and Exam (40%)

Final oral presentations will take place between April 3 and April 6, 2023 at a day and time selected in October. The examining committee will be composed by the supervisor (and co-supervisor when applicable), the external examiner and the course coordinators.

There are 2 components for the oral presentation:

Three Minute Thesis (3MT): Students are asked to prepare a 3-minute speech during which they would explain the breath and significance of their research project to a non-specialist audience. Students are not required to use slides but they can if they chose to. This academic exercise is based on the 3-minute thesis competition for graduate students. Students should follow this link for more info and resources

<https://www.ualberta.ca/graduate-studies/professional-development/events/3minute-thesis/what-is-a-three-minute-thesis>

Honours Thesis Presentation: Students will prepare an oral presentation on their work for the final exam. The presentation must be no more than 15 minutes long. The presentation will be followed by questioning from the committee members. Students will be expected to know the general background literature relevant to their particular research topic, the rationale for their hypothesis and details and soundness of the experimental approach used. They should know the details of the methods used and understand the basis of the other methods described in the thesis as part of their experiments but not performed by the students themselves. They should be able to discuss the significance, strengths and limitations of their findings and put them in context with current knowledge in the field.

After the presentation there will be some time so that feedback concerning the student's performance at the oral exam can be provided. In addition, at a separate time that is convenient for both, the supervisor and the student are encouraged to meet formally. In particular, the supervisor should point out the strengths and weaknesses of the student's oral presentation and written report, as discussed by the examining committee.

APPENDICES

Appendix 1: Guidelines for the preparation of the thesis proposal

The thesis proposal document should be written using Times New Roman 12 points and should be no longer than 15 double-spaced pages (not including table of contents, lists of figures and tables, figures or references). Page margins should be set at not more than 1inch.

In general terms the thesis proposal document should include:

(a) Abstract: the abstract is a brief summary of the thesis proposal. Its length should not exceed ~250 words. It presents a brief introduction to the issue; it contains the key statement(s) of the thesis and gives a summary of how the student wants to address the issue. It also includes the possible implications of the proposed work, if successfully completed.

(b) Introduction: provides sufficient background for readers to understand where the study is coming from and indicates the general scope of the project, without going into so much detail, which will be presented in later sections (e.g. literature review).

(c) Background/ literature review: describes previous scientific findings that serve as foundation for the current project. This section offers the theoretical / conceptual framework for the project.

(d) Thesis statement: states the thesis in a couple of sentences. This statement can take the form of a hypothesis, research question, project statement, or goal statement. The thesis statement should capture the essence of the intended project and also help to put boundaries around it.

(e) Outline of the research plan: the research plan should include goals (or specific aims), methodology and an anticipated timeline for completion.

(f) Significance of the work proposed: discusses the substantive, methodological, and/or theoretical contribution the project will make to existing knowledge in the (sub)field. It also states the importance of the problem and/or objectives of the study, in the context of current knowledge and practices. It should also explain the usefulness or benefits of the study, if possible, to both the outside world and the research community.

(g) Bibliography: A list of papers cited in the thesis proposal document is also required; this must conform to accepted styles of scientific literature citations. Please follow the format of Journal of Neuroscience. For example: Woo NH, Duffy SN, Abel T, Nguyen PV (2000) Genetic and pharmacological demonstration of differential recruitment of cAMP-dependent protein kinases by synaptic activity. Journal of neurophysiology 84:2739-2745.

(h) Figures and tables (if included) should be clearly labeled and placed in order at the end of the paper, after the bibliography. Each figure or table should have a legend.

Appendix 2: Guidelines for the preparation of the final thesis

The thesis document should be written using Times New Roman 12 points and should be no longer than 20 double-spaced pages (not including table of contents, lists of figures and tables, figures or references). Page margins should be set at not more than 1 inch.

In general terms the thesis document should include:

- (a) Title page including subtitle (if required), author and research mentor(s).
- (b) Abstract: it should explain why the work is important. Its length should not exceed ~250 words. It should state the experimental approach(s), give a summary of the major results and explain the most important implications of the work performed.
- (b) Table of content: comprises a list of all headings and subheadings with page numbers.
- (c) List of figures: Lists page numbers of all figures. The list should include a short title for each figure but not the whole caption.
- (d) List of tables (if required): Lists page numbers of all tables. The list should include a short title for each table but not the whole caption.
- (e) Introduction/background: without repeating the abstract the introduction should state the reason(s) for undertaking the study. It should include sufficient background information to allow the reader to understand the context and significance of the scientific question addressed in the thesis. The analysis of the literature should be focused on the thesis question. This is not a review paper.
- (f) Experimental design and methods: this section includes information to allow the reader to judge the believability of the results and to allow other researchers to replicate the experiments described in the thesis. It should include a description of the materials and procedures, calculations, the analytical methods, statistical analysis and equipment description (if needed). It should also establish the limitations, assumptions, and range of validity of the methods used.
- (g) Results: The results are actual statements of observations, including statistics, figures, videos, tables, etc. This section should include positive as well as negative results, without their interpretation (which should be put in the discussion). Sufficient details should be provided so that the readers can draw their own inferences and construct their own explanations. Results can be broken up into logical segments by using subheadings. Experiments performed by other members of the lab that are required for the understanding of the thesis can be included with the correspondent acknowledgment (see notes at the end).
- (i) Discussion: the discussion section should include the major patterns in the observations, highlighting relationships, trends and generalizations among the results. It should indicate if the findings prove or disprove the hypothesis stated in the original thesis proposal and whether they are in agreement or disagreement with previous work. In this section the results should be interpreted in terms of their relationship with the original question. This section should also highlight the significance of the results. This section should be rich in references to similar work and background needed to interpret results.
- (J) Bibliography: A list of papers cited in the thesis proposal document is also required; this must conform to accepted styles of scientific literature citations. Please follow the Journal of Neuroscience format, e.g. Woo NH, Abel T, Nguyen V (2000) Genetic and pharmacological demonstration of differential recruitment of cAMP-dependent protein kinases by synaptic activity. *Journal of Neurophysiology* 84:2739-2745.
- (K) Figures and tables should be clearly labeled and placed in order at the end of the paper, after the bibliography. Each figure or table should have a legend.

Appendix 3: IMPORTANT NOTES FOR STUDENTS

1- Student's Responsibilities:

a) *Safety*: All students must receive the appropriate safety training for their respective lab environment (e.g. BL1, BL2 facility, etc.), and must complete the UAlberta WHMIS safety course, which can be accessed here: <http://www.ehs.ualberta.ca/traininh.aspx>

Additional safety training is at the discretion of the supervisor and could include online courses in biosafety, chemical safety, as well as in-person training regarding laboratory safety procedures (eye wash stations, fire precautions, etc.). If the student will be working with animals, they will need part 1 training, and possible part 2 training. Please consult with your supervisor. More information can be found here:

<https://www.ualberta.ca/research/support/ethics-office/education-training-user-support/animal-research-ethics-training>


Additional information on lab safety can be found at the following link: http://www.ehs.ualberta.ca/DocumentsandProcedures/~media/Environmental%20Health%20and%20Safety/Documents/Biosafety/Biosafety_Guidelines.pdf

b) *Ethics & conduct*: All students must report their experimental results honestly. Primary data should be submitted to the supervisor. There is a zero tolerance policy at the UofA for data fabrication, manipulation, or plagiarism (see below). Examples of data manipulation include: reporting only the “trials that worked” from a series of experiments, splicing of western blots, etc. Examples of plagiarism include: copying text from another source verbatim, or referencing someone else’s published ideas without proper citation, etc.

"The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behavior (online at www.governance.ualberta.ca) and avoid any behavior which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University."

All forms of dishonesty are unacceptable at the University. Any offence will be reported to the Associate Dean of Science who will determine the disciplinary action to be taken. Cheating, plagiarism and misrepresentation of facts are serious offences.

2- COLLABORATIONS

The University of Alberta recognizes collaboration as an important part of intellectual and academic development. Collaboration can produce creative and innovative ideas and research; however, if students engage in inappropriate collaboration, it gives them unfair academic advantage and is a violation of the Code of Student Behavior.  Much like citing your sources in a paper, it’s all about being transparent. When assigning you a grade, your professors need to know how much of the work was your own and to what extent you received help. It is acceptable that you include in your written documents and/or oral presentations data (in the form of figures, tables, etc.), schemes, diagrams, etc. from other people from your research group if the contributions of other are highlighted appropriately. For more information follow the *Appropriate Collaboration link on the Office of Student Judicial Affairs website*

<http://www.osja.ualberta.ca/Students/AppropriateCollaboration.aspx>

3- STUDENTS ELIGIBLE FOR ACCESSIBILITY-RELATED ACCOMMODATIONS (students registered with Specialized Support & Disability Services - SSDS): Eligible students have both rights and responsibilities with regard to accessibility-related accommodations. Consequently, scheduling exam accommodations in accordance with SSDS deadlines and procedures is essential. Please note adherence to procedures and deadlines is required for U of A to provide accommodations. Contact SSDS (www.sds.ualberta.ca) for further information.

Appendix 4: Supervisor/Examiner resources

Guidelines for the evaluation of the thesis proposal document

Supervisors are encouraged to provide students with suggestions on the structure and the content of the thesis proposal, and to revise preliminary drafts, but should not contribute significantly to the final document.

There is much leeway for objectively determining what constitutes “fair” or “excellent” performance in a course. However, some fundamental criteria can be suggested:

- 1) The document should be clearly written with a logical organization and “flow” of ideas.
- 2) Literature that is relevant to the research project should be discussed to help framing the scientific questions asked and the hypothesis of the student’s work. The literature review should identify potential gaps in knowledge and establish a need for current and/or future research projects.
- 3) Hypothesis and rationale for the experiments proposed should be clearly stated.
- 4) The proposed experiments should have a clear connection with the research questions and/or hypotheses.
- 5) Material and methods proposed to be used should be clearly and sufficiently reported, including methods to be used for data analysis and interpretation.
- 6) The significance of the work proposed should be clearly stated.

Essays that are superbly written (with no errors in logic, style and facts), that satisfy all of the above criteria, AND that show excellent critical thinking and significant insight(s) should be graded as “outstanding” (94-100%). Essays that are well-written, and that satisfy all of the above criteria while showing no novel and potentially significant insight(s), should be graded as “excellent” (85-93%).

Essays that solidly satisfy most of the criteria above, without showing evidence of logical critical assessment of the literature or insights into the significance of the project and data should be graded as “very good” (81-84%).

The full grade scale should be used to assign marks below 81% as appropriate. Any essay that, in the opinion of the supervisor, shows evidence of plagiarism on the part of the student, should receive a failing mark, and the course coordinators should be notified.

Guidelines for the evaluation of the honours thesis document

Supervisors are encouraged to provide students with suggestions on the structure and the content of the thesis proposal, and to revise preliminary drafts, but should not contribute significantly to the final document.

There is much leeway for objectively determining what constitutes “fair” or “excellent” performance in a course. However, some fundamental criteria can be suggested:

- 1) The report should be clearly written with a logical organization and “flow” of ideas and hypotheses.
- 2) The literature should be reviewed critically, in the context of the scientific question to be answered.
- 3) The approach/methods should be carefully explained and with sufficient detail.
- 4) The results should be clearly defined, in an organized and logical manner. The student must make clear to the reader which statements are observation and which are interpretation. Figures and tables should be clearly labeled and of a quality that would be suitable for a thesis or research paper.
- 5) The discussion should clearly reveal the ability of the student to critically interpret the significance of the project and/or data produced, limitations and strengths.

Essays that are superbly written (with no errors in logic, style and facts), that satisfy all of the above criteria, AND that show excellent critical thinking and significant insight(s) should be graded as “outstanding” (94-100%).

Essays that are well-written, and that satisfy all of the above criteria while showing no novel and potentially significant insight(s), should be graded as “excellent” (85-93%).

Essays that solidly satisfy most of the criteria above, without showing evidence of logical critical assessment of the literature or insights into the significance of the project and data should be graded as “very good” (81-84%).

The full grade scale should be used to assign marks below 81% as appropriate.

Grading

Final grades in this course are on a 4-point scale, defined as follows:

Outstanding	94-100%	4.0	A+
Excellent	85-93%	4.0	A
Very good	81-84%	3.7	A-
	77-80%	3.3	B+
	73-76%	3.0	B
Good	70-72%	2.7	B-
	64-69%	2.3	C+
Satisfactory	61-63%	2.0	C
	57-60%	1.7	C-
Minimal Pass	54-57%	1.0	D
Fail	1-53%	0.0	F