NEURO 498/499: HONOURS RESEARCH PROJECT IN NEUROSCIENCE

GUIDELINES FOR STUDENTS AND SUPERVISORS

Students taking NEURO 498/499 and their supervisors are asked to please review the following guidelines to understand what is expected of the students in these courses. This document also provides general guidelines for preparing for the exams (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. 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.

NEURO 498

Course Format

In addition to the research performed in the selected laboratory, the course comprises one 90 min. workshop led by the course coordinator. The workshop will take place on September 17th at 4:00 PM in room 9-32 MSB. It will address the mechanics of hypothesis formulation, background acquisition; and references selection and management as well it will discuss general guidelines for writing a thesis proposal.

Expectations

1) Time commitment

Students enrolled in NEURO 498 are expected to spend a minimum of 20 hours/week working in the lab of their 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 are strongly encouraged to discuss with their potential supervisor their project and to agree on the specific time commitment required.

2) Thesis Proposal

Students are required to become familiar with the literature pertinent to the scientific question that they are going to investigate, to learn how to formulate a hypothesis based on the existing evidence and to design an experimental plan (in conjunction with their supervisor) to test that hypothesis. Students are required to write the thesis proposal, make an oral presentation of the thesis proposal and to defend it in front of an examining committee.

3) Laboratory work

Students will begin experiments to answer their research question. 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.

Methods of Evaluation

(A) Thesis Proposal Document
Students will write a thesis proposal document that includes the following sections:

(a) Abstract: the abstract is a brief summary of the thesis proposal. Its length should not exceed ~200 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.

The thesis proposal document must be submitted to the course coordinator, the supervisor, a second expert examiner, and a reader at least one week before the oral presentation and exam.

The supervisor, the second examiner and the reader should read and mark the report before the oral examination takes place. The selection of a second faculty member examiner is the responsibility of the supervisor. The reader will be selected by the course coordinator.

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.

(B) Oral Presentation and Exam

Students will prepare an oral presentation on their thesis proposal. The presentation will be followed by questioning from the committee members. The oral presentation and thesis defense will take place between November 4th and November 14th 2015, at a day and time to be determined by the examining committee in consultation with each student. The examining committee will be composed by the supervisor, the second examiner and the course coordinator.

The presentation must be no more than 20 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 explain 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.

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 and at a separate time that is convenient for both, the supervisor and the student are encouraged to meet formally so that feedback concerning the student's performance at the oral exam can be provided. 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.

(C) Laboratory Performance

The performance of the student in the lab will be evaluated by the supervisor and/or a designated member of the supervisor's lab (research associate, PDF) with whom the student would be working. The lab performance mark should consider the student's diligence, hours spent on laboratory work, technical competence at the bench, originality where applicable, problem-solving ability, perseverance, motivation, and general aptitude for laboratory research.

Grading

The final grade for the course will be determined from the aggregate marks obtained from the written report, oral presentation, and laboratory performance, each weighed as follows:

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%
Lab performance mark (supervisor-assigned).............................................................................. 20%

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

<table>
<thead>
<tr>
<th>Grade</th>
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</thead>
<tbody>
<tr>
<td>Outstanding</td>
<td>94-100%</td>
<td>4.0</td>
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<td>3.7</td>
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<td></td>
<td>77-80%</td>
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<tr>
<td>Good</td>
<td>73-76%</td>
<td>3.0</td>
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<td></td>
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</tr>
<tr>
<td>Satisfactory</td>
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</tr>
<tr>
<td></td>
<td>57-60%</td>
<td>1.7</td>
</tr>
<tr>
<td>Minimal Pass</td>
<td>54-57%</td>
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</tr>
<tr>
<td>Fail</td>
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NEURO 499

Course Format

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

Expectations

1) Time commitment

Students enrolled in NEURO 499 are expected to spend a minimum of 20 hours/week working in the lab of their 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 are strongly encouraged to discuss with their potential supervisor their project and to agree on the specific time commitment required.

2) Laboratory work

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

3) Research Thesis

Students will produce a written honours thesis on their project. An oral presentation and thesis defense will occur at the end of term.

Methods of Evaluation

(A) Honours Thesis Document

Students will write a honour thesis document that comprises:

(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) Hypothesis: states the hypothesis to be tested.
(g) 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.
(h) 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.


(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.

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

The thesis document must be submitted to the course coordinator, the supervisor, a second expert examiner, and a reader at least one week before the oral presentation and exam.

The supervisor, the second examiner and the reader should read and mark the report before the oral examination takes place. The selection of a second faculty member is the responsibility of the supervisor and all considerations should be taken to secure the same faculty for NEURO 498 and NEURO 499. The reader will be selected by the course coordinator.

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.

(B) Oral Presentation and Thesis Defense

Students will prepare an oral presentation on their work for the final exam. The examining committee will be composed by the supervisor, the second examiner and the course coordinator. Final exams will take place between April 1st and April 8th 2015.

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 student himself. 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 and at a separate time that is convenient for both, the supervisor and the student are encouraged to meet formally so that feedback concerning the student's performance at the oral exam can be provided. 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.

(C) Laboratory Performance

The performance of the student in the lab will be evaluated by the supervisor and/or the designated member of the supervisor's lab (research associate, PDF). The lab performance mark should consider the student's diligence, hours spent on laboratory work, technical competence at the bench, originality where applicable, problem-solving ability, perseverance, motivation, and general aptitude for laboratory research.

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The final grade for the course will be determined from the aggregate marks obtained from the written report, oral presentation, and laboratory performance, each weighed as follows:
Written thesis: 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......... 30%
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APPENDICES

1- Guidelines for the evaluation of the thesis proposal 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 coordinator should be notified.

2- Guidelines for the evaluation of the honours thesis 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.
IMPORTANT NOTES FOR STUDENTS:

1-. Student Responsibilities:

ACADEMIC INTEGRITY: “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 Behaviour (online at www.governance.ualberta.ca) and avoid any behaviour 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. Anyone who engages in these practices will receive at minimum a grade of zero for the exam or paper in question and no opportunity will be given to replace the grade or redistribute the weights. As well, in the Faculty of Science the sanction for cheating on any examination will include a disciplinary failing grade (NO EXCEPTIONS) and senior students should expect a period of suspension or expulsion from the University of Alberta.

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 Behaviour. 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.ssds.ualberta.ca) for further information.