

PHYC 4800/4850

STUDENT GUIDE TO RESEARCH PROJECTS I/II

(2022/2023)

INTRODUCTION

The PHYC 4800 **Research Project I** course is a three credit-hour course held in the Fall term. The PHYC 4850 **Research Project II** course is the analogous Winter term course. Physics Honours students normally must take both courses. While these courses are not required for Majors students, you may take either one as a Physics elective that can count towards the Physics credit requirements for your degree. A variety of research topics can be found on the Physics Department website, www.physics.dal.ca, under **RESEARCH**. Most faculty members will take on students and some faculty members will even advertise possible projects.

In each term students will produce a *research proposal* (and present a *brief corresponding oral presentation in the fall term*), a mid-term *progress report and presentation* and a *final thesis* (and present an *oral thesis defence*). Each student will have a supervisory committee consisting of the supervisor, second reader and coordinator of this course. The reports will be presented in front of these committees. **All students should attend** and are welcome to discuss the proposals/reports.

Honours students may choose to begin a new research project with a new supervisor in the winter term or to continue working with the same supervisor on a similar research project. During each term **you are required to spend at least six hours per week on your project**. So please make sure you have enough time to do so. To prevent problems, be sure to have frequent, frank, and open discussions with your supervisor and committee as to what your project will involve and what is expected of you. Discuss the time commitments (an agreed upon schedule) and possible research outcomes. The project is a commitment from both sides and should be considered as an informal contract between you and your supervisor.

When defining a project with your supervisor you should keep in mind that while you may continue a project that you have worked on as a summer student or as a co-op student, **only the work completed during the course should be presented as being new**; the summer/work-term project should appear as background/prior work. In any case, you are expected to devote the same amount of time on your project during the fall and winter terms as students who are beginning new projects and your grade for the honours thesis will be based on the new work you do during the course. If you have any problems reaching a mutually satisfactory understanding with your supervisor, discuss these problems with the PHYC 4800/4850 Coordinator.

To assist you in managing your time during your fourth year, and to ensure that your project is completed on schedule, your responsibilities and those of your supervisor and coordinator are outlined below. This is followed by detailed guidelines for the reports and presentations. See the **Schedules** on page 10 for specific dates for the 2021-2022 academic year.

Your coordinator for this class is Ian Hill, email: ian.hill@dal.ca, Dunn Building rooms 319 and 228; tel. 902 494 3897.

RESPONSIBILITIES OF THE STUDENT

1. By the end of the first week of classes, provide the coordinator, via email, with the name of the faculty member who has agreed to act as supervisor for your research project and the tentative project title, and the name of your second reader (discuss with your supervisor), if confirmed. If you have difficulties finding a supervisor, please see the coordinator as soon as possible.!
2. Shortly thereafter (see schedule) submit your short, concise research proposal. By that time, you should have a good idea of the tasks involved, have read several published scientific papers on the subject and put in place the mechanics to make a serious start on the project. Submit to the coordinator the most relevant of these papers.
3. At the end of the first month of the term (see schedule), give an oral presentation of your proposed research to your supervisory committee. This is to ensure that everybody agrees and understands what you want to do.
4. Conduct research during the term in accordance with your research plan and as directed by your supervisor and committee. You should talk to your supervisor at least once every week to discuss your research progress and to deal with any problems that arise. However, more frequent meetings may be appropriate, particularly at the beginning of the project. You will, for this semester, be part of a research group, so make yourself aware of what is going on in the group.
5. By the middle of the term meet with your supervisory committee to discuss your progress. Be ready to give a PowerPoint presentation (see schedule). The committee will evaluate your progress, help you along with suggestions and identify possible problems. The committee will decide on an overall numerical mark for the progress and the supervisor will communicate, on behalf of the committee, a short summary to you.
6. By the middle of November (Fall term) or the middle of March (Winter term) you should have completed your research (experiments or calculations, etc.) and you should be working on writing your thesis. Please be aware of the deadline for submitting the thesis and plan your writing accordingly. Do not fall into the trap of spending a few more days gathering data. The longer you delay your writing, the greater the stress you will experience at the end of the term when the thesis must be submitted and when you will also need to think about exams in other courses. And **NO** — you will not be able to get an extension for completing your thesis. Remember, this honours thesis is meant to be an opportunity for you to see whether you enjoy and can successfully carry out a research project. **Incomplete projects are acceptable.** *In this case, the exercise is for you to demonstrate in your written report that you understand what is missing, what would be required to complete the work and how best to achieve these final results.* Your written thesis and oral presentation will form the basis on which we will evaluate your work. Therefore, be sure to allow yourself plenty of time to prepare these to the best of your ability by the required date of submission.
7. Approximately a week or two before the end of classes (see schedule), submit a completed thesis draft to your supervisor.

8. Correct the thesis in accordance with comments from your supervisor and, near the end of classes (see schedule), submit a completed thesis, as critiqued and approved by your supervisor, to the course coordinator and your second reader.
9. Near the end of the exam period, orally defend your thesis (dates subject to change).

RESPONSIBILITIES OF THE SUPERVISOR

1. Assist the student in defining reasonable goals and provide comments on the student's research proposal. Be as clear as possible about your expectations.
2. Ensure that a reasonable work schedule is established and encourage the student to devote sufficient time to the project. Come to an understanding with the student on the time commitment. In addition, the student should participate in all research group activities. If the student does not adhere to an agreed upon time commitment it is the responsibility of the supervisor to report this to the coordinator who may remove the student from the course.
3. Provide guidance to the student throughout the term on all matters related to the research project.
4. Ensure that everything is in place so that suitable progress can be made and alert the coordinator immediately when serious problems arise.
5. Review the draft thesis and provide the student with comments as soon as possible so that corrections can be made prior to the distribution of the thesis to the second reader.
6. Provide the coordinator with a timely assessment of the overall research performance, written reports and oral presentations as outlined in the grade breakdown.
7. Provide feedback to the student at every stage, particularly after a grade has been given. Explain why the particular grade has been given.

GRADE BREAKDOWN

The course grade will be assigned in accordance with the following table. Up to **10%** may be deducted from each grade for failure to meet the appropriate deadlines. Conversion between percentage and letter grades will follow standard Faculty of Science guidelines (attached).

Task/item for evaluation	Grade Weight	Grading responsibility
Written Research Proposal	10%	Supervisory Committee
Progress Report Written and oral	20%	Supervisory Committee
Oral Defence	20%	Average of Faculty Evaluations
Thesis	30%	Average of Supervisor and Second Reader
Overall Research Performance	20%	Supervisor
TOTAL	100%	

GUIDELINES FOR RESEARCH PROPOSAL

Your research proposal should be about one page in length using regular font size (11 or 12pt) and line spacing (1.5 line spacing). You should prepare a draft and discuss this with your supervisor prior to finalizing the proposal and submitting it to the members of your committee. Please include the following in your proposal:

A. *Title, your name, supervisor's name*

B. *Introduction*

In a few sentences give some background information about your project with references indicating that you did a reference review.

C. *Objectives*

The objectives of the research must be focused and well defined. This should not be more than one or two sentences. Formulate this carefully. This is to be kept in mind throughout the project.

D. *Methodology*

Describe the proposed experimental or theoretical approach, the rationale for its choice and the methods and procedures to be used.

E. *References*

Include the appropriate references in the format described on page 7. Submit to the coordinator the most relevant article retrieved by you electronically.

RESEARCH PROPOSAL ORAL PRESENTATION GUIDELINES

The oral presentation of the research proposal to the supervisory committee should be 5-10 minutes in length and will be followed by a discussion with the Committee.

The goal is to gauge your knowledge and the clarity of your objectives. Also, the goal is to ensure that the tools are available to do the experiment, that you are aware of potential difficulties and are aware of the support available.

Normally, the presentations should include:

- A title “page” with the title, your name and the supervisor’s name.
- A general “Introduction” about your research topic.
- A “Summary” of your research goals.
- A “Methods” section describing the approach you will take to reach your goals.
- Likely outcomes.

Comments and grade (10% of final grade) of the proposal and discussion will be collected and communicated to you by your supervisor.

PROGRESS REPORT GUIDELINES

- All reports must be in electronic format. Your supervisor/reader may request a paper copy, but electronic is the default.
- The overall length of the report should be about five pages (longer if heavy on figures).
- The research that you have done so far will eventually form part of your final thesis and much of what you write in your progress report will form the basis for your thesis.
- The contents of your report can be organized as follows:
 - a. Title Page: The title should consist of the minimum number of words necessary to accurately portray the contents of the report. Reader interest is stimulated by a well-chosen title. Only the title, your name and the name of your supervisor should appear on the title page.
 - b. Introduction: The introduction should lead to the development of the subject so that the reader may obtain a clear understanding of the significance of the report and the goals of your research. The introduction must refer to general references in the field.
 - c. Results: The main argument for doing the research and the results are presented. Data or results obtained thus far should be summarized. Data and results can often be presented most effectively as graphs or tables. A discussion of problems encountered, and a discussion of the work needed to complete the research project should be included.
 - d. References: A suitable reference list should be appended so that readers may be able to consult important works that you used during the preparation of your

report. References should be numbered consecutively in the order that they appear in the text and should follow the form shown below.

For a journal article: A.G. Cohen, A. De Rujula and S.L. Glashow, "A Matter Antimatter Universe?" *Astrophysical Journal* **495** (1998) 539.

For a book: N. Cartwright *How the Laws of Physics Lie* (Oxford University Press, Oxford 1983).

- Tables should be numbered consecutively using Roman numerals: Table I, Table II, etc. Each table should be referred to by number in the text and should have a caption that explains the table without having to read the full report. Each table should be incorporated in the report near the text where the table is discussed.
- You may use one or the other (but not both) of the following styles for the figures in your report: (a) numbered consecutively using Arabic numbers with a decimal point, i.e., Fig. 2.3 is the third figure appearing in chapter 2; or (b) numbered consecutively using Arabic numerals: Figure 1, Figure 2, etc. Each figure should be referred to by number in the text and should have a caption that explains the figure without having to read the full report. Each figure and its caption should be incorporated in the report near the text where the figure is discussed. For more information on how to write a report or article see the style manual for physicists: www.aip.org/pubser/s/style.html

FINAL WRITTEN REPORT (THESIS) PREPARATION GUIDELINES

- All reports must be in electronic format. Your supervisor/reader may request a paper copy, but electronic is the default.
- The pages of the report **must be numbered** consecutively. The overall length of the report, which includes the introduction, body and conclusions, but excluding references, table of contents, figure captions, tables, appendices (if any), etc, **must be at least 5000 words, and normally not more than 6000 words.** This amounts to about 20 pages and will normally not exceed 25 pages (but depends on the number of figure/tables). Spacing should be 1 or **1.5 max, font size 12.** Margins should be 3/4" to 1".
- Some portions of the final report will be a logical extension of the material presented in your progress report.
- In general, the contents of a report shall be organized as follows:
 - a. Title Page:
 - b. Table of Contents: The table of contents should be complete and consist of a list of the sections of the report, including appendices, tables and figures with the page number where they can be found.
 - c. Abstract: The abstract should give a brief summary of your research project, including the main conclusion. The abstract should not exceed 150 words.

- d. Introduction: The introduction should lead to the development of the subject so that the reader may obtain a clear understanding of the significance of the report and the goals of your research. The introduction must refer to general references in the field.
- e. Body: The main argument of the subject is carried out in the body of the report, complete with supporting data. The argument should proceed in a logical sequence according to a prepared outline. Data and results can often be presented most effectively as graphs or tables. This section is often divided into Theory, Methods, Results, and Discussion.
- f. Conclusion: The conclusions are often considered the most important part of a report. They should be stated concisely in a separate section at the end of the report.
- g. References: A suitable reference list should be appended so that readers may be able to consult important works that you used during the preparation of your report. References should be numbered consecutively in the order that they appear in the text and should follow the form shown below.

For a journal article: A.G. Cohen, A. De Rujula and S.L. Glashow, "A Matter Antimatter Universe?" *Astrophysical Journal* **495** (1998) 539.

For a book: N. Cartwright *How the Laws of Physics Lie* (Oxford University Press, Oxford 1983).

- Tables and figures should have a caption that explains carefully the table or figure without having to read the full report. Each table or figure should be incorporated in the report near the text where it is discussed.
- Detailed mathematical proofs, development of equations, and examples which are subordinate to the main argument in the body of the report, but not essential to follow the argument, should appear as appendices. Any equations, figures, or tables should be numbered consecutively and referred to in the text with such numbers.
- See the American Institute of Physics style manual for all aspects, including accepted abbreviations of journals www.aip.org/pubservs/style.html

Your written thesis will be graded by your supervisor and second reader using the following guidelines:

1. adherence to proper scientific writing style, proper usage of grammar, sentence structure, spelling, and the overall clarity of the text (**10%**);
2. organization and oral presentation (**20%**);
3. the quality of your project design: the sophistication, ingenuity of the methods used, overall quality as evident from the results (**30%**);
4. the analysis and interpretation (discussion) of your results (**30%**), including the justification of the models or approximations used; and
5. the literature review (**10%**). This literature review refers to the understanding and use of articles used in the course of this research, particularly in the introduction and discussion.

Feedback can be requested from the supervisor at any stage of the project. Make sure you go over your thesis with your supervisor before submitting the final copy. Feedback about oral presentations can also be obtained from the coordinator.

ORAL THESIS DEFENCE GUIDELINES

The oral thesis defence should be 15 - 20 minutes long, that will be announced at least a week before the defence. This will be followed by at least five minutes for questions. The presentation should be aimed at an audience of third year Physics students. You should schedule a “dry run” of the presentation with your supervisor (and possibly other members of the research group) prior to the formal presentation.

A typical presentation would include:

- A title “page” with the title, your name and your supervisor’s name.
- A general “Introduction” about your research topic.
- A “Theory” section (use equations, graphs or figures as appropriate).
- A “Methods” section.
- A “Results” section with a comparison between theory and experiment (if appropriate).
- End your talk with “Conclusions” that highlights the main findings of your project. For the presentation of the progress report, you should discuss your plans for the remainder of the project. For the final presentation, you should discuss possibilities for further work.
- If appropriate, an “Acknowledgements” to the faculty/staff/students who helped you with your project.

Oral defence suggestions:

- Use PowerPoint slides (or similar).
- Text on the screen should be visible from the back of the room.
- Emphasize your points with “one-liner” view graphs or slides.
- Use a laser pointer or appropriate features of PowerPoint to indicate items on the screen.
- Tables should be either avoided or used sparingly.
- Scales on graphs should be clearly marked (including units) and visible to the audience.
- Include error bars on data whenever appropriate.
- Do not race through your slides. One slide per minute is a good guide.
- If possible, indicate the applications of your research, or at least say why your method was useful in a larger context.
- Presentations should be lively and should show that you are enthusiastic about the results.
- Practice in front of your friends and supervisor and ask for feedback.

The oral presentation will be graded using the following guidelines:

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| (1) level of presentation (20%) | (4) quality of the presentation (10%) |
| (2) quality of research (20%) | (5) enthusiasm for the subject (10%) |
| (3) clarity of the presentation (20%) | (6) handling of questions (20%) |

FACULTY OF SCIENCE GRADE CONVERSION SCHEME

Numerical grade	Letter grade
90 - 100	A+
85 - 89	A
80 - 84	A-
77 - 79	B+
73 - 76	B
70 - 72	B-
65 - 69	C+
60 - 64	C
55 - 59	C-
50 - 54	D
<50	F

Note:

Students with disabilities are encouraged to register as quickly as possible at the Student Accessibility Services if they want to receive academic accommodations. To do so please phone 494-2836, e-mail access@dal.ca, drop in at the Killam, G28 or visit our website at www.studentaccessibility.dal.ca.

Plagiarism

Dalhousie University defines plagiarism as "the submission or presentation of the work of another as if it were one's own."

Plagiarism is a **serious academic offence**. A finding of plagiarism may result in a failing grade of an assignment or course or, if very serious, suspension or expulsion from the university. In fact, if plagiarism is discovered after a student has completed his or her studies, and the penalty results in that student no longer meeting the requirements of a degree that has been awarded, the university may rescind that degree.

Some examples of plagiarism:

Failure to attribute authorship when using sources such as written or oral work, computer codes/programs, artistic or architectural works, scientific projects, performances, web page designs, graphical representations, diagrams, videos, and images.

Downloading all or part of the work of another from the Internet and submitting as one's own.
The use of a paper prepared by any person other than the individual claiming to be the author.

SCHEDULE OF DATES FOR RESEARCH PROJECTS FALL TERM 2022/2023

All written material should be submitted to the coordinator as a MS Word doc (or equivalent), and to the committee in the format they request (electronic or hard copy). **Note: Minor rescheduling of oral presentations may be necessary. The days for the presentations will be discussed with the class, to best-accommodate students' schedules.**

Item	Submit to	Date
Fall Term Classes Begin		Sept 6, 2022
Submit Name of Thesis Supervisor	Coordinator	Sept 13, 2022
Submit Research Proposal	Supervisor/Reader Coordinator	Sept 20, 2022
Presentation of Proposal	Committee and students	Week of Sept 26, 2022
Submit Progress Report	Supervisor/Reader Coordinator	Oct 28, 2022
Presentation Progress Report	Committee and students	Week of Oct 31, 2022
Submit Draft Thesis to Supervisor	Supervisor	Dec 1, 2022
Submit Thesis for Committee	Supervisor/Reader Coordinator	Dec 7, 2022
Final Oral Presentation	Committee and students	Week of Dec 12, 2022
Fall Term Classes End		Dec 7, 2022

SCHEDULE OF DATES FOR RESEARCH PROJECT WINTER TERM 2022/2023

Minor rescheduling of oral presentations may be necessary.

Item	Submit to	Date
Winter Term First Class		Jan 9, 2023
Submit Name of the Thesis Supervisor	Coordinator	not needed, if the same
Submit Research Proposal	Supervisor/Reader Coordinator	Jan 16, 2023
Submit Progress Report	Supervisor/Reader Coordinator	Feb 18, 2023
Presentation Progress Report	Committee and students	Week of Feb 27, 2023
Submit Draft Thesis to Supervisor	Supervisor	Mar 31, 2023
Submit Thesis for Committee	Supervisor/Reader Coordinator	Apr 7, 2023
Final Oral Presentation	Committee and students	Week of Apr 17, 2023