

**Course Outline: Physics 499: Directed Studies
2009-2010**

1. **Contact Information & Office Hours:** Carl Adams, Rm 1006 Physical Sciences Complex, x5337, in research lab PS 1063, or in undergrad labs 1023/1026 or 1079. Email: cadams@stfx.ca. I am usually in my office or lab from 9 to 5 each day with the exception of classes and labs. Please arrange for an appointment if you would like to talk about something for 10 minutes or more.
2. **Summary:** Students will prepare and present a paper based on original research they have performed under the supervision of a faculty member. The purpose will be to give you an idea of the steps that take place in scientific research: the proposal, the background research, your own research, the analysis, the conclusions, and the written and oral dissemination to an audience of peers and expert reviewers. The requirements and marking will be the same as PHYS 493 Honours Thesis but this course is open with permission of the Chair to Advanced Major students who have demonstrated interest and aptitude in scientific research.
3. **Website:** <http://www.stfx.ca/people/cadams> and follow the PHYS 499 links. It is not a great website by any means but it is a good place to put things.
4. **Grading scheme:**

Preliminary Talk (dept grade)	10%
Final Talk (dept grade)	10%
Written Paper and Project Assessment (supervisor)	60%
Written Paper (2nd reader)	20%
5. **General:** I refer your attention to Section 3.9 of the Academic Calendar **Regulations on Plagiarism, Cheating, and Academic Dishonesty**. These regulations extend to material and data copied in labs as well as exams, midterms, and assignments. I support a safe classroom environment free of harassment or discrimination for all students regardless of race, religion, gender, sexual orientation, gender identity, or disability.
6. **Expectations:** There are several components required to successfully complete PHYS 499. Briefly
 - (a) Select a supervisor and general topic for your paper and inform me before the beginning of classes. In this case the supervisor must be a member of the physics department.
 - (b) Work in conjunction with the physics seminar coordinator to schedule your Preliminary Talk and provide the coordinator with abstracts one week prior to the talk. (Before the end of 1st term, generally in one of the last two regular seminar slots for the calendar year. In some circumstances the talk may also be scheduled for early January.) See the numerous posted abstracts of regular seminars for a guide to abstract writing.
 - (c) Prepare and present your Preliminary Project talk. The talk should be 15-20 minutes in length with 5 minutes for questions. See further guidelines below.
 - (d) Again schedule your final talk and provide an abstract. The talk should be roughly 20-25 minutes in length with 5 minutes for questions. See further guidelines below. This will usually be scheduled in the last two regular seminar slots of the academic year but we may schedule a special session (often the last day of classes).

- (e) In conjunction with myself and your supervisor select a 2nd reader for your project.(mid-March) Under normal circumstances the 2nd reader would be a St. FX physics faculty member. The choice of the 2nd reader will primarily be based on expertise in the project topic or method. The final decision will rest with me.
- (f) The due date for the written project is March 31, 2010. At this time provide copies of your thesis to your supervisor and the 2nd reader. At the discretion of your supervisor and 2nd reader they may be satisfied with electronic copies. I require a hard copy for the department records. I can either receive a hard copy directly from you on the due date or a “clean copy” from your supervisor once they have finished with it. Keep in mind that the project to a certain extent is “published” and public. Other students and professors may access it now and for the indefinite future. (The marks and our comments of course remain private.)

7. Guidelines

As a general guideline for scientific research keep your efforts focused on one or two key questions related to your hypothesis. (*Why* you are doing this research is also a question.) You will find that answering the key questions involves many separate steps. A *steady* effort applied to those questions is most likely to yield results, and at the same time will naturally lead you to increasing your background knowledge. As you work through the steps you will also develop the habit of assessing whether or not your answers or results make sense. Of course there is also room for speculation and new ideas but we expect you to be able to put those ideas to the test.

Your supervisor is the key contact for guidance and assistance. Your supervisor will also be responsible to provide you with the necessary resources to complete the project. Notwithstanding informal office/study use by all physics students, room 1031 is formally set aside for your use should you require it. Your supervisor is not expected to act as your personal “Google” or “Wiki”, conclusion maker, code checker, or copy editor. Most supervisors will be disappointed with incomplete work, thought, or effort on your part.

Also note that your mark is not so much determined from “success” of a project. We know that some projects do not result in a new, clear scientific result. Conversely if you have achieved new, clear scientific results, but demonstrate little knowledge of the topic, seem to have put very little of your own effort into the work, or submit a sloppy or incomplete project, a high mark is not guaranteed.

The goal of the preliminary talk is to give a 15-20 minute presentation, at a level accessible to senior physics undergraduates, that describes the goals and methods of your proposed project. Your goal is to convince us that the project is clearly defined, relevant, doable, and will have results that will make an impact. To achieve this, you should consider many, if not all, of the following:

- Clearly and succinctly describe the scientific question to be addressed.
- Relate the question to previous and current work in the area.
- Clearly identify why we should care about the answer to the question. If it’s so important, why hasn’t this project been done already?
- Describe the methods by which you will seek the answer. Identify difficulties and limitations of your approach, as well as strengths.

- Outline some educated guesses about the possible outcomes. What are the implications of each?
- You may give some initial results from your research, but this should not be the main focus.
- Likewise excessive “polishing” and putting fancy Powerpoint effects in the talk should not be the main focus.
- It is also expected that you be familiar enough with the material to answer questions, realizing that some of us will be trying to probe your depth of knowledge. In addition these talks are open to the wider university community. You may expect questions from non-physics faculty.
- Keep in mind that you have taken a large number of physics courses from us. Don’t abandon the knowledge and expertise you have gained for formulas and figures taken from the web. Also graphs have labels, lines have slopes, formulas sometimes have vectors, notation may need to be explained, we use the English language.
- Practicing your talk for duration and delivery with a few friends and/or your supervisor is almost essential.

As a guide you could imagine that you are making a presentation to try and obtain funding for your scientific project. One source of further advice (suggested by Peter Marzlin) is *The Craft of Scientific Presentations: Critical Steps to Succeed and Critical Errors to Avoid* by Michael Alley ISBN 0-387-95555-0. It is not in our library but is available from Dalhousie.

The marks that we give on this presentation do not necessarily reflect a certain percentage ascribed to each part of the talk but how well each of us thought you achieved your goal. The mark is determined as an average of marks given by physics faculty members present at your talk. I will give you your mark and a summary of comments from the faculty by no later than early January or 1 week after your talk if your talk is in January.

Coordinate use of the presentation unit and any computer issues with the seminar coordinator.

The final talk should be more formal such as you would give at a research conference. It can also be slightly longer as necessary (20-25 minutes). You should consider the issues addressed in the Preliminary Talk, and additionally:

- Pay particular attention to your introduction. It should be sufficient to orient a physical scientist from another field about what you are doing. It does not have to include everything that was included in the preliminary talk.
- Present results with care, leaving time to explain what you are showing. Wherever possible, relate results back to the question to be answered.
- If you encountered serious difficulties explain them and your efforts to deal with them.
- What new questions are raised by your findings?

The written project should include an abstract, an introduction, a description of methods, a presentation of results, analysis, discussion, conclusions, and a scientific bibliography with references. Sometimes results, analysis, and discussion are combined. Acknowledgements and table of contents may also be appropriate. Please ask for previous theses or projects or have a closer look at the structure of papers in the literature for clues to appropriate style. Editing of the project would be handled between you and your supervisor, not the 2nd reader or me. The copy the 2nd reader receives should be the final copy.

8. **Deadlines: If you can't make the deadlines please contact me well in advance.** I don't have a formal penalty system set up for late work but I do need to enforce fair standards. I may request at least a verbal progress report from you or your supervisor at short notice throughout the year.

9. **Discontinued Theses:** There may be times when you decide to not continue with the project for credit or times when I feel you will not attain a passing grade (based on the preliminary talk or from discussions with your supervisor). It may be appropriate to change to an Advanced Major project and/or change supervisors. Again contact me ASAP if you feel this is the case so you can add an extra 3 credit course if necessary. The deadline to drop a full year course or add a 2nd term course is Jan. 11. People without 120 credits very rarely graduate!