PHYD01H3 – Fall 2022

Research Project in Physics and Astrophysics

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Office Hours: By appointment

Course Description

Introduces students to current research in physics or astrophysics under the supervision of a professorial faculty member. Students undertake an independent project that can be of a theoretical, computational or experimental nature. Evaluation is by the supervising faculty member in consultation with the course supervisor. Students must obtain consent of the course supervisor to enroll in this course.

Supervisors can be physics or astronomy faculty members at any U of T campus.

Prerequisites**:**

14.0 credits, cumulative GPA of at least 2.5, and permission from the coordinator.

Exclusions:

PHY478H, PHY479Y1

Enrolment

Enrolment in this course is different from other courses.

To enrol in a supervised study course, students must find a professor who will agree to supervise the course, and then follow the steps outlined below.

Step 1: Request the course on ACORN. Your status will be interim (INT). You will not be officially enrolled until you complete the remaining steps.

Step 2: Fill the 'Student' section on a Supervised Study Form available at: https://www.utsc.utoronto.ca/registrar/supervised-study-form.

Step 3: Once you fill-in the Student section, contact your supervisor and provide them with the form. Your supervisor will complete their section and forward the form to the course coordinator for departmental approval.

Step 4: Once the project is approved at the departmental level, the form will be submitted to the Registrar's Office and your status on ACORN will be updated from interim (INT) to approved (APP).

Course Evaluation

Written proposal:	20%
Progress report:	15%
Final report:	35%
Final presentation:	30%

The proposal and reports should be emailed directly to the supervisor. The course coordinator should be CC'ed on the email to enable them to keep a record of student progress and work.

Additional details about these evaluations are found later in this document.

Students are evaluated on a letter-grade basis. These grades will map onto the middle of the range used by University of Toronto Scarborough (link) as follows:

Grade	UTSC percentage range	Grade
A+	90 – 100%	95%
A	85 – 89%	87%
A−	80 – 84%	82%
B+	77 – 79%	78%
B	73 – 76%	75%
B−	70 – 72%	71%
C+	67 – 69%	68%
C	63 – 66%	65%
C−	60 – 62%	61%
D+	57 – 59%	58%
D	53 – 56%	55%
D−	50 – 52%	51%
F	0 – 49%	0, 25%, or 49%

File name submission guideline (for all work)

Submit your proposal, progress, and final report files using the following naming convention:

PHYD01_2022_LASTNAME_FIRSTNAME_STUDENT#_******.PDF

*where your name, student # are inserted, & **** is "proposal", "progress-report", or "final-report".*

Course Expectations

Students should learn about all aspects of conducting the research from the supervisor. Students will be asked to submit work to the supervisor, i.e., the proposal, progress report, and final report. The course coordinator must also be sent a copy of this work for their records. The student will present their project to their supervisor, the course coordinator, as well as other faculty and students at the end of the term.

Students will spend as much time as necessary do to the research properly. However, UTSC regulations impose a limit of approximately six hours per week for the project. This aligns with a standard course that has three hours per week of class time plus a few hours for readings and homework.

Undergraduate research projects are expected to involve independent research, enabling academic accountability and evaluation of the work of each student. When more than one student is involved in a project, the roles of each student should be clearly specified in the course and research proposals so that some degree of independence can be assured.

Course organization

Meetings with supervisors

Students will meet regularly with their supervisor to discuss the research project being undertaken. The frequency of these meetings is up to the student and supervisor. It is suggested that meetings should be weekly.

There must be meetings a minimum of twice per month.

While it may be agreed that a student is responsible for setting meeting times with the supervisor, the supervisor has a responsibility for ensuring meetings occur should a student fail to arrange regular meetings. If a students or supervisor has concerns about meetings, they should contact the course coordinator.

The student is responsible for participating fully in course research seminars (if any) and lab meetings (if any) and meeting all deadlines for reports and presentations.

Co-supervision

Research time may be spent with postdoctoral and graduate students and research assistants in addition to the faculty supervisor. The responsibilities of these co-supervisors are to be specified in each case and with the agreement of all parties involved. However, the faculty member remains responsible for the formal approval and evaluation of the project.

Questions and email policy

Students should consult their supervisor for their email policy. The course coordinator's email policy is to respond within two business days. *Students must include PHYD01 in the email subject and provide their full name and student number in the message.*

Course components

The research for the project should be conducted during the term of study.

Written proposal

The research proposal is the first major component of the independent research course. This document should:

- Describe the topic and the motivation for the research.
  - Why is this a good area for study? What is its significance? What problems does it solve or contribute to solving?
- Make connections between the proposed research and the existing literature. This should include properly cited references.
- Identify the specific question(s) the research project will answer or explore.
- Specify what methods or techniques you will use to carry out the research.
  - This should make clear whether you have an understanding of these techniques and seek to apply them or if you are also developing these skills.
- Create benchmarks for accomplishing the intended work, e.g., set out an expected timeline for the term.
- Identify anticipated challenges and a strategy for overcoming them. Ensure the plan is achievable.
- Be clear about the outcomes of the project: what are the goals and objectives?

The document should be clear, concise, and focus on the major themes. 3 – 5 pages should suffice. Use 12 point font, single line spacing, and 2 cm page margins.

Due on the last day of September.

Progress update

A short progress update must be emailed to supervisor (copy the course coordinator). This update should be a minimum of half a page long and a maximum of one page.

This update should include:

- the goal of the project,
- brief summary of the work done so far,
- expected challenges, and
- a general plan for the next month.

The progress update will be an opportunity for students to reflect on their progress and challenges, prompt feedback from the supervisor, and update the course coordinator.

Due on the last day of October.

Please note that supervisors can take the quality and content of the progress update into account when determining the progress grade but may also consider other factors.

Final report

Student must produce a substantive written report containing significant analysis and interpretation of a previously approved topic.

The report shall be 5 – 10 pages and use 12 point font, single line spacing, and 2 cm page margins. This length includes figures and excludes references or appendices. Latex is preferred. If using Word, please submit final files as a PDF.

The Centre for Teaching and Learning (CTL) has a writing centre with resources and staff to assist in your report writing skills. It is strongly advised that you make use of this service.

The supervising faculty member is responsible for reading research proposals and drafts of the final report, giving timely and constructive feedback, and submitting the final grade for the course coordinator.

An electronic (PDF format) copy must be given to both the supervisor and course coordinator. A printed copy may be requested as well. The report grade will be determined by consensus between by the supervisor and the course coordinator.

The final report is due on December 02.

Tips:

- All writing benefits immensely from having someone read it and offer comments. This can be your supervisor, a post-doc or grad student in the research team, or a friend.

- **Editing and re-writing is critical to good writing.** Ensure you leave sufficient time to write a draft, get comments from others, and carefully re-read and edit the work.

- All figures must have captions and axis labels. All tables must have captions.

- References must be properly cited and formatted. If unsure, talk to the library or your supervisor.

- Re-check that you have fully expressed the different parts of your report and that it is well organized, e.g.: introduction, a description of methods used, results, discussion, and conclusions.

- An abstract is required. Writing a short (~one paragraph) summary of your work can be helpful in identifying the core idea/result/story.

- Proofread to check spelling and grammar!

Final presentation

Every student will present their work to other students and members of the physics and astronomy faculty at the end of course. At least one faculty member other than the supervisor should be present and be able to provide feedback to the supervisor that may be taken into account when assigning a grade for the presentation.

These presentations will be structured as an oral exam and held between December 05 and 06.

Presentations are to be a minimum of 10 minutes and a maximum of 15 minutes long. This presentation time limit will be strictly enforced. There will be up to 10 minutes for questions.

A practice session for the final presentations will be scheduled by the course coordinator.

The presentation grade will be determined by consensus between the supervisor and the course coordinator. It will take into consideration feedback from other faculty members.

Students are strongly encouraged to actively participate in other students' presentations by listening and asking questions during the Q&A. A student who demonstrates engagement by asking quality questions during others' talks can be awarded additional points on their presentation grade.

Tips:

- What is the story? There should be a beginning (e.g., a problem or question and motivation for doing the research), middle (data/methods/analysis), and end (results/conclusions).
- Context: situate your work – how does your project fit within the work of others and broader discipline?
- Equations: do not simply define each term individually. Explain what the equation physically means, how the terms related to the physical system being described/studied, which are most important, and how this connects to the research topic and question(s).
- **Rehearsing is key to effective presentations.** This is true of novices and experts alike.
  - Being a good speaker/presenter is a skill that is developed through deliberate practice and effort.
- Do. Not. Simply. Read. Your. Slides.
- Eye contact with your audience is important for engagement.
- Dress professionally. Practice to be a leading researcher in your field at a conference.

When using figures on slides, make sure that the axes labels and scales can be read by your audience. A common mistake is to have labels that are too small to read. For this reason, you likely want to save two copies of your figures when you create them: one for a report (small font) and one for presentations (larger font).

Relevant U of T Policies

Academic Integrity

The University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.

Details: http://www.governingcouncil.utoronto.ca/policies/behaveac.htm

Potential offences in papers and assignments include using someone else's ideas or words without appropriate acknowledgement, submitting your own work in more than one course without the permission of the instructor, making up sources or facts, obtaining or providing unauthorized assistance on any assignment.

On tests and exams cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

Accessibility

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the Access*Ability* Services as soon as possible.

Access*Ability* Services staff (located in Room AA142) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations 416-287-7560 or email ability.utsc@utoronto.ca. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.