

Physics 4910
Advanced Physics Project
Course Outline

Calendar Description: Physics 4910F/G – Advanced Physics Project (6.0 hours, 0.5 course)

A research project in advanced experimental, theoretical, or computational physics under faculty supervision. It is intended to provide students with experience in the design, implementation, and presentation of a physics experiment.

Pre-requisites: Physics 2101A, 2110B and 2910F/G with a minimum mark of 72% in each; and permission of the Department

Note: Though this course and [Physics 4999E](#) Honours Thesis Project are not anti-requisites, the project undertaken for [Physics 4910F/G](#) must be distinctly different from that of [Physics 4999E](#), if applicable. It is also required that the project is supervised by one of the core faculty members in Physics or Astronomy.

Course Instructors:

Physics 4910F - Fall	Physics 4910G - Winter
Dr. Pauline Barmby	Dr. Tamie Poepping
Email: pbarmby@uwo.ca	Email: poeping@uwo.ca
Office hours: Friday 1230-1330 or by appointment: book a Zoom meeting at https://calendly.com/pbarmby	Office hours: by appointment via email

Course website: Physics 4910 FW 2023 on OWL owl.uwo.ca/portal

Learning Objectives: The main goals of this course are to:

- Develop your experimental skills beyond the level of Phys 2910F/G;
- Provide advanced training in computerized data acquisition and analysis;
- Improve your skills in preparing and presenting research communication in a variety of formats (written reports, poster, oral presentation).

Learning Outcomes: By the end of this course, you are expected to have proficiency in the following computational, laboratory, and writing skills:

- Effectively use software codes or physical instrumentation related to your project.
- Basic skills in keeping a record of your activities, data, and results, and in preparing research reports.
- Identifying errors associated with laboratory measurements in order to explain if experimental results are significantly different from calculated or theoretically predicted values.
- Basic understanding of the importance of experimental uncertainties in the analysis and interpretation of your data.

- Competence in computerized data acquisition and analysis relevant to your project.

Course Expectations: The minimum requirements for this course are:

- 1) A **one-page project proposal** should be submitted by email by **September 21, 2023 (fall) or January 25, 2024 (winter)** to be approved jointly by the research supervisor and the course instructor.
- 2) Working 4-6 hours/week throughout the 13 weeks in the term on your research project under the direction of your research supervisor. Please note that the end of the 6th week marks the end of your *training* period. This is to allow sufficient time to complete your independent project and to write a methodology section.
- 3) Attending the Physics 4910 events listed below. Participation in all is required for course credit.
 - **Initiation meeting:** [*] (fall)/[*] (winter). If you have a conflict with other courses during the designated time, contact your instructor immediately to arrange an alternative time.
 - **Poster presentations** in November or in March (March date TBD in conjunction with PhUnC conference).
 - **Final project presentations** in December or in April (April date in conjunction with Physics 3900 final project presentations).

Evaluation: Your final grade in this course will be calculated according to:

	Fall	Winter	
Lab notebook quality and completeness - Checked monthly by research supervisor - Checked periodically by course instructor	Oct. 18, Nov. 8, Dec. 6	Feb. 14, Mar. 13, Apr. 3	10% total
Methodology section (written report)	Nov. 6	March 11	25%
Midterm evaluation (research performance grade by supervisor)	October 31	February 29	10%
Poster presentation (upload 2 days before)	Nov. 23	March (date TBD)	10%
Final project presentation	Dec. 7	April 4	15%
Project implementation (research performance grade by supervisor)	December	April	30%

Lab notebook: All students are required to keep a record of their work in a laboratory notebook, which can be electronic or hard copy.

- The purpose of a laboratory record is to have a sufficiently detailed record of your experiments such that someone else could reconstruct what you did. This is essential in case you – or others – need to check or repeat your measurements in the future. In a research laboratory – whether academic or industrial – laboratory notebooks are legal documents that can be important for establishing priority, obtaining patents, etc.
- Your lab notebook will be checked and signed by your supervisor (at least monthly) and checked periodically (see dates above) by your course instructor during the term to ensure it is being properly kept. It is up to you to schedule and arrange signatures.

Project design and implementation (evaluation by supervisor):

- **Project expectations:** A large fraction of your mark for this course will be based on an experimental or computational project that you will design, build, and carry out in the second half of the term. If you work on a computational project, it should encompass new code, or a new module for existing code, that you will develop on your own. The only major constraint is time: you must finish your project by the end of term.
- **Proposal:** a one-page project proposal to be approved jointly by the research supervisor and the course instructor. Please submit by email to your instructor and your supervisor by end of day indicated above.
- **Timeline:** It is expected that you will be working in a research group setting and will complete training for the relevant research skills during the first 6 weeks. By the end of the 6th week (**October 20, 2023, or February 16, 2024**), your training period should mostly be complete, and you should start working on the design and implementation of your project.
- **Evaluation:** A large part of your grade will be based on observations of your research skills and effectiveness in the lab setting as assessed by your research supervisor via a midterm evaluation (10%) and final project implementation evaluation (30%).

Methodology section: A written report describing your methodology is required by the designated deadline above and will be evaluated by your course instructor. This should take the form of a methodology section of a published article. More instructions and examples from previous years are provided on OWL.

Poster presentation (10%): your project progress is to be presented as a poster presentation at a conference event. A poster template can be found under OWL *Resources*. Submit your completed poster via OWL Assignments. The department will cover the cost of printing if you use the template and submit by the designated deadline.

Final Presentation (15%): In addition to your written reports, you will be required to make a final oral presentation (15 minutes + 5 for questions) describing your project. Your presentation should target a general physics audience consisting of the course instructor, upper year physics students, and staff or other faculty members recruited as judges. Do not presume that the audience is familiar with your specific area of study.

Grades: *All scores* will be transferred to the Gradebook on OWL. Any errors, or appeals to your scores, must be reported to your instructor *within two weeks* of their initial posting. *Please note*, your *final course grade* must come officially from the Registrar's Office and will not be posted on OWL. The Department of Physics and Astronomy may, in exceptional cases, adjust the final course marks to conform to Departmental policy.

Safety and Security: Some experiments may involve lasers, radioactive materials, or chemicals. If you do not have a recent WHMIS certification from Western, you must complete this via OWL. Additionally, your supervisor will provide group-specific safety training. Please submit any Certificates of Completion to your supervisor. No food or drink is permitted in the experimental laboratory under any circumstances. Never remove equipment from the lab or allow anyone else to do so without permission from the faculty.

Use of Generative AI: The learning outcomes of this course include reading scientific literature, understanding and summarizing it, and generating your own contributions to the literature as you document your research. Writing about science develops your thinking in a way that reading alone does

not, so it is very important for you to write your documents yourself. The use of generative AI tools (ChatGPT, etc) to summarize text does not develop your own understanding and may produce written material that looks authoritative but is factually incorrect or biased. Like other writing tools (e.g., Grammarly), generative AI tools may be useful for revising text that you have written.

The assignments that you submit for this course should not include text that was generated from scratch from an AI tool prompt. You may (but are not required to) use AI tools to revise text that you originally wrote, in which case you must declare that use in the same way that you would declare your use of any other software written by someone else. You are ultimately responsible for any inaccuracies in your written work, whether introduced by AI tools or by yourself. Please be aware that confidential data, e.g., non-public research data, should not be entered into generative AI tools.

Integrity in science involves claiming credit only for work that you performed; the use of AI tools without acknowledgment violates this integrity. If you are found to have used AI tools inappropriately, this will be considered a violation of Western's academic integrity and scholastic offense policies. Please ask if you have questions about this topic or this policy.

STUDENT ABSENCES

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

Assessments worth less than 10% of the overall course grade:

- Please inform the instructor of the missed component.
- Absences for the poster presentation will be handled by re-weighting to the final presentation and methodology report.
- Absences for one lab notebook requirement will be handled by marking the project proposal instead.

Assessments worth 10% or more of the overall course grade:

- For work totalling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf.
- The Student Medical Certificate is available at https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.
- Absences for the methodology document or final presentation will be handled with extensions.

ACCOMMODATION AND ACCESSIBILITY

Religious Accommodation: When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at <https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>.

Accommodation Policies: Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing.

The policy on Academic Accommodation for Students with Disabilities can be found at: www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf.

ACADEMIC POLICIES

The website for Registrarial Services is www.registrar.uwo.ca.

In accordance with policy, www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf, the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following website:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

SUPPORT SERVICES

Counseling — Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on add/drop courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/>.

Learning Skills — Learning-skills counsellors at the Student Development Centre (<https://learning.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Mental Health — Students who are in emotional/mental distress should refer to Mental Health @Western for a complete list of options about how to obtain help: <https://uwo.ca/health/>.

Gender-Based and Sexual Violence — Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at https://www.uwo.ca/health/student_support/survivor_support/get-help.html. To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Accessibility — Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at academicsupport.uwo.ca/accessible_education/index.html if you have any questions regarding accommodations.

Thriving — Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: www.uwo.ca/se/digital/

Student Council services — Additional student-run support services are offered by the USC, <https://westernusc.ca/services/>

Science Student Donation Fund — This course gratefully acknowledges support from the Science Student Donation Fund. If you are a B.Sc. or B.M.Sc. student registered in the Faculty of Science or Schulich School of Medicine and Dentistry, you contribute to the Science Student Donation Fund, which is administered by the Science Students' Council (SSC). One or more grants from the Fund have allowed for the purchase of lab equipment integral to teaching this course. However, you may opt out of the Fee by the end of September of each academic year by completing the online form linked from the Faculty of Science's Academic Counselling site. For further information on the process of awarding grants from the Fund or how these grants have benefitted undergraduate education in this course, consult the chair of the department or email the Science Students' Council at ssc@uwo.ca. In the front pages of your lab manual, you will find examples of some the lab equipment partially funded through the Science Student Donation Fund.

Complaints and Suggestions: If you have a concern about something, please let us know. We rely on your feedback. Please contact initially the person most directly concerned – this will usually be your instructor. If that is not satisfactory, or if there is something more general bothering you, talk it over with the Physics & Astronomy Department Chair or the Associate Chair of Undergraduate Affairs (for contact information see www.physics.uwo.ca).