THE UNIVERSITY OF BRITISH COLUMBIA

PHIL 469A 001 – TOPICS IN PHILOSOPHY OF SCIENCE: PHILOSOPHICAL ISSUES OF QUANTUM THEORY

Winter Term 2: Jan. 5 – Apr. 10, 2026; Credits: 3
Space: GEOG 214
Time: Tue Thu 2pm – 3:30pm

Instructor: Dr. Alexandre Korolev
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Office: BUCH E172
Office hours: By appointment.

Course Description:

This course aims at clarifying the deep conceptual puzzles of quantum theory, moving beyond formulas to ask what it means for reality, observation, and knowledge, covering topics like the measurement problem, interpretations, non-locality, quantum logic, and the role of probability, bridging physics formalism with philosophical inquiry. We will introduce some core quantum concepts (wave functions, operators) just enough to tackle foundational questions, examining how QT challenges classical ideas about determinism, objectivity, and the nature of physical states.

Major Topics Covered:

- Summary of core quantum phenomena through eight emblematic experiments, providing a solid empirical foundation.
- Discussion of the traditional quantum formalism to argue that standard quantum mechanics is more of a predictive "recipe" than a full physical theory.
- Intro to three main proper theories that recover the quantum predictions: (1) The spontaneous wavefunction collapse theory (Ghirardi, Rimini, Weber or GRW theory), (2) The pilot-wave theory of deBroglie and Bohm, which is deterministic, and (3) The Many Worlds interpretation of Everett, which is conceptually unique and challenging.

Depending on how it goes and the interest/background of the students, we may discuss each interpretation's ontology and probability problem, including non-locality, the meaning of the wavefunction, and quantum logic.

Level and Accessibility:

The course is targeted at philosophy of science students who are interested in getting a clearer, more rigorous, and honest presentation of the philosophical foundations of quantum theory. It does not require advanced mathematical knowledge of quantum mechanics, but it is not a simple popular science book either. The purpose is not to copy any existing Physics courses on quantum mechanics, but rather to attempt to make the very abstract and difficult physical concepts accessible to undergraduate philosophy students with minimal technical physics background without sacrificing much of accuracy.

Required Text:

- Tim Maudlin, *Philosophy of Physics: Quantum Theory,* (Princeton University Press, Princeton and Oxford, 2019). Available in bookstore.
- Other required literature made available through course Canvas site or internet.

Prerequisites:

PHIL 340 or 12 credits of mathematics or science.

Course Website: www.canvas.ubc.ca → PHIL 469 001 2025W1

Class Format:

The general format of this seminar is a mixture of in-class lectures, in-class student presentations, in-class discussions, and periodic small written assignments pertaining to the required readings. Also, each student is expected to produce an individual term paper or project on the topics related to the course material.

Evaluation:

Class Participation	10%
Short In-Class Quizzes	20%
Two Class Presentations	40%
Term Paper or Project	30%

- ***Class Participation:*** You are encouraged not only to regularly attend the classes but also to actively participate in class discussions helping the whole class come up with a better understanding of the material. Class participation can give you 10% towards your final grade.
- ***Short In-Class Quizzes:*** We will have several in-class short quizzes, roughly one per week, to give you feedback on how well you've understood the readings for a given week. The quizzes will be of the reading-comprehension type, typically short-answer or multiple-choice questions. When computing the final mark, all quizzes are considered to be as carrying the same weight; the quiz mark amounts to 20% of your final mark.

- ***Two Class Presentations:*** Each student is expected to give (at least) two class presentations. A presentation can be done either individually or by teams. The topics for presentations will be discussed in class as the course progresses. Presentations count for 40% of your final grade.
- ***Term Paper or Project:*** Each student is expected to produce a term paper or a project on the topics related to the course material. The class presentations may be used to try out material for your term paper but, of course, your term paper must be your own work. Topics for the paper or the project should be discussed with, and approved by, the instructor before you start seriously working on it. The term paper / project weighs 30% of your final grade.

The Structure of the Course:

1. Chapter 1: Eight Experiments
2. Chapter 2: The Quantum Recipe
3. Chapter 3: The Wavefunction and the Problem of Local Beables
4. Chapter 4: Pilot Wave Theories
5. Chapter 5: Many Worlds Interpretation
6. Chapter 6: Further Topics

Academic Concessions, Missed Assignments, and Grade Changes:

According to the newly revised University Academic Concession policy taking effect on Sep. 1, 2019, students must contact me, the instructor, via email as soon as you are aware you may need an in-term concession. I will adjudicate your first request. You need to include a Student Self-Declaration form, found on the Arts Advising website at

https://www.arts.ubc.ca/wp-content/uploads/sites/24/2019/10/Student-Self-Declaration-Form-1.6-Arts.pdf

Please note that, according to the new policy, for all consecutive concessions (second, third, etc.), you must make your request directly to your appropriate Faculty Advising Office. The official guidelines of what types of academic concessions are available to you and what procedures you need to follow to request them can be found at the following page:

https://www.arts.ubc.ca/degree-planning/academic-performance/academic-concession/

If you do have a University-valid excuse for missing any of the graded activities (see above about Academic Concession), I will transfer the weight of what you have missed to the weight of your final exam.

If you wish to have a grade reconsidered, write a brief note stating your reason. Typically, the note will outline what you take to be the requirements of a good answer and point out where you believe you met these requirements.

University Policies:

- **UBC General Policies:**

  UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website at https://senate.ubc.ca/vancouver/policies-resources-support-student-success/

- **UBC Plagiarism Policy:**

  Plagiarism, which is intellectual theft, occurs where an individual submits or presents the oral or written work of another person as his or her own. Scholarship quite properly rests upon examining and referring to the thoughts and writings of others. However, when another person's words (i.e. phrases, sentences, or paragraphs), ideas, or entire works are used, the author must be acknowledged in the text, in footnotes, in endnotes, or in another accepted form of academic citation. Where direct quotations are made, they must be clearly delineated (for example, within quotation marks or separately indented). Failure to provide proper attribution is plagiarism because it represents someone else's work as one's own. Plagiarism should not occur in submitted drafts or final works. A student who seeks assistance from a tutor or other scholastic aids must ensure that the work submitted is the student's own. Students are responsible for ensuring that any work submitted does not constitute plagiarism. Students who are in any doubt as to what constitutes plagiarism should consult their instructor before handing in any assignments. A link about Academic misconduct is as follows:

  https://academicintegrity.ubc.ca/regulation-process/academic-misconduct/

- **Students with special needs:**

  Students who require accommodations in this course due to a disability affecting mobility, vision, hearing, learning, or mental or physical health are advised to discuss their needs with the Disability Resource Centre at Brock Hall, Room 1203, 1874 East Mall or visit their website at

  https://you.ubc.ca/ubc-life/campus-community/students-disabilities

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Version: Dec. 15, 2025