

**CRITICAL DEBATES IN THE PHILOSOPHY OF SCIENCE:
SPACE FROM ZENO TO EINSTEIN AND QUANTUM MECHANICS**

PHIL 3170*01
Winter 2011
M W F 11:30 – 12:20
MACK, room 231

Instructor: Professor A. Wayne
Office: MACK 331
Office hours: Wed. 2:30 – 4:00
and by appointment
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Course outline

The first part of this course examines the development of our philosophical and scientific understanding of space, time, motion and cosmology from ancient times to the 21st century. We begin with Plato and Euclid. We then focus on the metaphysics and epistemology of classical space in the work of Newton, Leibniz, Berkeley and Mach. Finally, we study more recent work of Poincaré and Einstein. The second part of the course introduces the central concepts of quantum mechanics and analyzes the puzzles of action-at-a-distance and Schrodinger's cat. The approach of the course is interdisciplinary, combining historical and philosophical perspectives with the physicists' own reflections. The course will investigate ways in which physics and philosophy are, or should be, interdependent.

Texts and course materials

- Huggett, Nick, ed., *Space from Zeno to Einstein: Classic Readings with a Contemporary Commentary* (MIT Press, 1999).
- Rae, Alastair, *Quantum Physics: Illusion or Reality?* (Cambridge University Press, 1986)
- Online materials at <http://courselink.uoquelpg.ca>. You are responsible for accessing CourseLink regularly. Some course materials and grading comments may only be available on CourseLink.

Course requirements

- 10% Weekly reading synthesis papers
- 20% In-class presentation
- 20% Midterm test #1, Feb. 11
- 20% Midterm test #2, Mar. 25
- 30% Essay, 5-7 pages, first paragraph due Mar. 11 (10%), full essay due Apr. 8 (25%)

Reading responses are due at the beginning of each Monday class (except the first one). They should be 1-2 pages in length, and should synthesize and present one to three main points of the chapter (not the commentary). Each reading response should end with a good question about the reading. Each satisfactory reading response adds 1 percentage point to your final grade, up to a maximum of 10 points (late responses not accepted). Additional in-class exercises may also be a part of this component of your grade.

Electronic devices

In order to create a positive learning environment for all participants, this class is conducted in "airplane mode," which means that certain electronic devices are permitted on board, but with restricted use. Phones and other wireless handheld devices may not be used and must be turned off. Laptop computers may be used solely for purposes directly related to the course, such as note taking, and they must have all send/receive functions (wifi, Bluetooth and network connectivity) disabled.

Additional support

Students with special needs or requiring additional support are encouraged to speak with me as early in the term as possible to ensure that appropriate arrangements are made.

Tentative schedule

Week	Topic	Required reading
Part I: Space, spacetime, geometry and motion		
Jan. 12	Plato	Huggett, Ch. 1 and commentary
Jan. 17	Euclid	Huggett, Ch. 2 and commentary
Jan. 24	Newton	Huggett, Ch. 7 and commentary
Jan. 31	Leibniz and Clarke	Huggett, Ch. 8 and commentary
Feb. 7	Berkeley and Mach <i>Midterm test #1 Feb. 11</i>	Huggett, Ch. 9 and commentary
Feb. 14	From space to spacetime	Huggett, Ch. 10
Feb. 28	Poincaré	Huggett, Ch. 13 and commentary
Mar. 7	Einstein <i>Essay first paragraph due Mar. 11</i>	Huggett, Ch. 14 and commentary
Part II: Quantum Mechanics		
Mar. 14	Introduction to QM	Rae, Ch. 1
Mar. 21	Photon polarization <i>Midterm test #2 Mar. 25</i>	Rae, Ch. 2
Mar. 28	Mysterious action	Rae, Ch. 3
Apr. 4	Schrodinger's cat <i>Essay due Apr. 8</i>	Rae, Ch. 4

E-mail Communication

As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the university and its students.

When You Cannot Meet a Course Requirement...

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the undergraduate calendar for information on regulations and procedures for Academic Consideration:
<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Drop Date

The last date to drop one-semester Winter 2010 courses, without academic penalty, is **Friday, March 11**. For regulations and procedures for Dropping Courses, see the Undergraduate Calendar: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Copies of out-of-class assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity and enjoins all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. The Academic Misconduct Policy is detailed in the Undergraduate Calendar:
<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Recording of Materials

Presentations which are made in relation to course work—including lectures—cannot be recorded in any electronic media without the permission of the presenter, whether the instructor, a classmate or guest lecturer.

Resources

The Undergraduate Calendar is the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate programs. It can be found at:
<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/>