

Syllabus
PHIL 416-01/01H
Philosophy and Physics
Fall 2013

Instructor: Kent Staley
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Office hours: M 1:00–2:00/Th 11:00–1:00

1 Texts

Cushing, James T. *Philosophical Concepts in Physics: The Historical Relation between Philosophy and Scientific Theories*. Cambridge: Cambridge University Press, 1998. (JC)

Torretti, Roberto. *The Philosophy of Physics*. Cambridge: Cambridge University Press, 1999. (RT)

Additional readings to be distributed by the instructor via the course page on Blackboard.

2 Overview of the course

In this course we will survey the philosophical dimension of physics through its historical development. We will seek to understand the philosophical relevance of physics both in terms of the ontologies presented by physical theories (what things are) and the epistemologies of the methods through which physics is developed (how we know). A significant aspect of the course will involve the investigation of philosophical challenges and problems posed by modern physics (quantum theory, relativity).

The course is intended to be accessible both to physics and other science majors who may have a limited philosophical background and to students from the humanities with little background in physics. Thus, the approach will be historical and conceptual. The mathematics that is used will be explained in class. It is nonetheless advisable that students taking the course have some degree of familiarity with elementary calculus.

3 Course objectives

During this course, students are expected to:

- become familiar with some major developments in the history of physics
- learn how some important physical theories conceptualize the phenomena within their respective domains
- learn the guiding principles behind the development of physical theory
- become acquainted with some of the important experimental phenomena that have advanced our physical understanding
- become familiar with some of the ongoing debates over how to understand what certain physical theories tell us about the world
- become adept at explaining such issues in a clear and efficient manner
- develop a nuanced understanding of the relationship between philosophical understanding and scientific thought

4 Coursework

4.1 Course Blog

We will have a group blog for the course. You will need to sign up to write five substantial blog posts regarding the readings. Blog posts should comprise about 200–300 words, though depth of engagement is more important than length. You may use your blog postings to pursue any avenue of thought that relates to the reading, including raising questions about points that seem obscure, raising objections to arguments, and discussing the relevance of the reading for other philosophical or scientific topics. You will also need to write at least ten substantive comments regarding other students' blog posts. You must complete your blog post on an assigned reading by 12:00 Noon on the day before the scheduled discussion of that reading. This will allow time for other students to comment on your post. The blog will also allow us to continue discussion at times when the instructor is away at conferences and unable to hold class meetings.

4.2 Research Paper

You will be required to write a research paper on a topic that you will choose, subject to the approval of the instructor. A paper proposal will be required in advance. Papers that are not handed in by the deadline will have their grade reduced by 10%, and an additional 10% will be taken off for every additional day the paper is late. The paper will enable the instructor to evaluate your ability to extend your thinking about the philosophical dimensions of physics into topics and questions not directly addressed in the course.

4.3 Exams

There will be one exam given in class for each of the three sections of the course. The exams will focus on the concepts and historical developments discussed in class and in the readings. The exams are intended to evaluate how well you have understood the historical and philosophical investigations we have undertaken through readings, lectures, and discussion. They also evaluate your facility at expressing concisely and clearly your understanding of this material. Exams will be given on closed-book, closed-note basis and will include both short-answer questions and essay questions.

5 Grades

Your grade for the course will be based on the accumulation of points received on individual assignments. The total point value of each is as follows:

Course blog*	250
First Exam	150
Second Exam	150
Third Exam	200
Research Paper	250
Total	1000

* up to 30 points for each blog post; up to 10 points for each comment

Course grades will be based on total accumulated points as follows:

940–1000	A	(4.0)
900–939	A-	(3.7)
865–899	B+	(3.3)
835–864	B	(3.0)
800–834	B-	(2.7)
765–799	C+	(2.3)
735–764	C	(2.0)
700–734	C-	(1.7)
600–699	D	(1.0)
<600	F	(0.0)

6 A Word on Academic Honesty

I will be vigilant in enforcing a strict code of ethical academic conduct. Here is a simple rule to follow to avoid any difficulties: *If you use the work of someone else in anything you write for this class you must make it clear that you are doing so, and indicate (through footnotes, quotation marks, etc. as appropriate) whose words or ideas you are using.* Violations of this rule will be treated as plagiarism.

Here is SLU's Academic Honesty Policy: "The University reserves the right to penalize any student whose academic conduct at any time is, in its judgment, detrimental to the University. Such Conduct shall include cases of plagiarism, collusion, cheating, giving or receiving or offering or soliciting information in examinations, or the use of previously prepared material in examinations or quizzes. Violations should be reported to your course instructor, who will investigate and adjudicate them according to the Policy on Academic Honesty of the College of Arts and Sciences. If the charges are found to be true, the student may be liable for academic or disciplinary probation, suspension, or expulsion by the University."

7 Attendance

I will take attendance for every class meeting after the first week. Students missing more than four classes will have their course grade reduced by one letter grade (e.g., an A becomes a B, an A- becomes a B-, etc.). Every three additional absences will bring a further letter grade reduction. Attendance will also be considered in deciding borderline grades. I will assume that all absences are for good reasons such as illness, so you do not need to provide excuses (unless you miss an assignment). Exceptions will be made only for extended illness or other circumstances that make these limits unreasonable.

8 Student Success Center

In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. Students who think they might benefit from these resources can find out more about:

- Course-level support (e.g., faculty member, departmental resources, etc.) by asking your course instructor.
- University-level support (e.g., tutoring/writing services, Disability Services) by visiting the Student Success Center (BSC 331) or by going to www.slu.edu/success.

Students who believe that, due to a disability, they could benefit from academic accommodations are encouraged to contact Disability Services at 314-977-8885 or visit the Student Success Center. Confidentiality will be observed in all inquiries.

Course instructors support student accommodation requests when an approved letter from Disability Services has been received and when students discuss these accommodations with the instructor after receipt of the approved letter.

9 Life is Full of Surprises

Sometimes the need arises to change ones approach to doing things. Learning is no exception. Consequently, the information given in this syllabus is subject to change on short notice (but not without reason). Such changes, should they arise, will be announced in class. You are responsible for keeping track of any changes in course assignments or schedule.

10 Course Schedule

Class meets on Tuesday and Thursday, 9:30–10:45am, in Ritter Hall 232.

Schedule of Readings for Class Meetings	
Part I: Newtonian Physics	
8/27	Introduction
8/29	JC: “Newton’s <i>Principia</i> ,” 89–102; RT: “Newton,” 41–50 Excerpts from Newton’s <i>Principia</i> : 381–83; 403–417
9/3	JC: “Views on Space Prior to Newton” and “Newton’s Absolute Space,” 155–59 RT: “Newton,” pp. 50–57
9/5	JC: “Newton’s Law of Universal Gravitation,” 103–13; RT: “Newton,” 57–74 Excerpt from Newton’s <i>Principia</i> : 794–813
9/10	RT: “Newton,” 75–83
9/12	Continued Discussion
9/17	First Exam
Part II: Relativity Theory	
9/19	JC: “Maxwell’s Theory,” 195–207
9/24	JC: “The Background to and Essentials of Special Relativity,” 225–40 Excerpt from Einstein’s “On the Electrodynamics of Moving Bodies”
9/26	continued discussion
10/1	RT: “Einstein’s Physics of Principles” and “Minkowski’s Spacetime,” 249–71
10/3	JC: “Further Logical Consequences of Einstein’s Postulates,” 241–51 RT: “Philosophical Problems of Special Relativity,” 271–89
10/8	JC: “General Relativity and the Expanding Universe,” 252–70
10/10	continued discussion
10/15	Second Exam
Part III: Quantum Theory	
10/17	JC: “The Road to Quantum Mechanics,” 273–89
10/22	No class (Fall break)
10/24	RT: “Quantum Mechanics: Background,” 307–21
10/29	JC: “Copenhagen Quantum Mechanics,” 290–304 RT: “The Constitution of Quantum Mechanics,” 321–49
10/31	continued discussion
11/5	JC: “Is Quantum Mechanics Complete?” 305–15 RT: “The Measurement Problem,” 355–67
11/7	JC: “The EPR Paper and Bell’s Theorem,” 319–24 Einstein, Podolsky, and Rosen, “Can Quantum-Mechanical Description of Reality Be Considered Complete?”
11/12	JC: “The EPR Paper and Bell’s Theorem,” 324–30’
11/14	RT: “The EPR Problem,” 349–55
11/19	Howard: “Einstein on Locality and Separability”; research paper proposal due
11/21	JC: “An Alternative Version of Quantum Mechanics,” 331–44 RT: “Hidden Variables,” 373–78
11/26	continued discussion
11/28	No class (Thanksgiving)
12/3	RT: “Many Worlds,” 387–93
12/5	Continued Discussion
12/10	Research paper due (5:00pm)
12/17	Third exam (8:00–9:50 am)