Department of Philosophy, Brown University

PL161: Philosophy of Relativity Physics

Spring 2008

Instructor: Douglas Kutach
Brown University
Department of Philosophy
Box 1918
Providence, RI 02912

Course Hours: 2:30 PM - 3:50 PM Tuesday and Thursday in Smith-Buonanno Hall G12

Office Hours: Monday 2:00 PM to 4:00 PM.

Telephone: (401) 863-3242

Textbooks: Albert Einstein, *Relativity: The Special and the General Theory*; Barry Dainton, *Time and Space*. On reserve at the Rock is John Earman, *World Enough and Space-time*; Michael Friedman, *The Foundations of Space-Time Theories* OCRA password: einstein

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Course Description

The goal of this course is to analyze a wide range of philosophical issues that are informed by relativistic physics. The primary issue will be the philosophical debates over the ontological status of space and time, starting with the dispute between Newton and Leibniz about whether space is something above and beyond the properties of material bodies, and tracing how this debate evolved as attention shifted to relativistic theories. This debate was a motivating philosophical consideration in Einstein's development of relativity, so we will examine Einstein's role in the debate and how logical positivists interpreted relativity as supporting their broader philosophical program. Also, we will examine how relativity bears on our understanding of matter and energy.

There are no formal prerequisites for this course, but mathematics will be used in the course. I will presuppose that you understand differential calculus, vectors, and matrices. We will discuss the necessary elements of differential geometry for understanding the conceptual problems in relativity.

Tasks and Evaluations

Your grade for the course will be determined by these factors:

1. There will be six homework assignments throughout the semester, worth a total of 50% of your final grade. The goal of these assignments will be for you to write expositions of theoretical and philosophical issues that arise in relativity. You will be attempting to write articles of the kind a sophisticated science journalist would write, pitched at an educated adult audience. Two of the assignments will involve solving some simple physics problems.

2. There is a take-home mid-term exam worth 20% of your final grade. It will involve criticism of existing textbook and popular presentations of various aspects of special relativity, as well as analysis about the range of philosophical interpretations of the theory of relativity and spacetime physics more generally.

3. There is a comprehensive final worth 30% of your final grade.