

## Sample Syllabus

### Philosophy of Physics

#### Overview

This course covers a selection of topics in 19<sup>th</sup> and 20<sup>th</sup> century physics, from a philosophical and historical perspective. No prior knowledge of physics is required, but high school math will be helpful. Some of the questions addressed are: What are space and time? How can forces act at a distance? Are physical laws causal? Is the stuff of physics really real? How should knowledge of physics change our beliefs about the macroscopic world?

#### Texts

Marc Lange, *An Introduction to the Philosophy of Physics*

Background references: John Norton's online *Einstein for Everyone* textbook, and Bryan Roberts's online *Philosophico-Scientific Adventures* textbook.

Additional readings will be made available for download.

#### Assessment

40% Reading Responses

30% In-class Assignments

30% Essay

**Reading Responses:** Each week a question about the following week's readings will be posed. 300 - 400 word replies to the week's question are to be handed in at the beginning of class. Students may choose to write any 10 of these replies.

**In-class Assignments:** Throughout the semester, short assignments, activities, and quizzes will be done in class (individually and in groups). These will typically not be announced in advance.

**Essay:** A 7-9 page essay will be due near the end of the semester. In the essay you'll be asked to read and reflect on a classic text in physics.

#### Schedule of Readings

1. Introduction

Sklar, "Philosophy and the Physical Sciences"

2 & 3. Space & Time

Lange, Chapter 1

Leibniz-Clarke correspondence

Radiolab, "Space" and "Time"

4. Fields

Lange, Chapter 2

5. Dispositions and Causes

Lange, Chapter 3

Beebe, "Does Anything Hold the Universe Together?"

6. The Limits of Physical Explanation

Lange, Chapter 4

Hesse, *Forces and Fields: The Concept of Action at a Distance in Physics*, Chapter 8

7. Fields, Energy, Momentum

Lange, Chapter 5

8. Realism

Lange, Chapter 6

Hacking, "Experimentation and Scientific Realism"

Chang, "Preservative Realism and Its Discontents"

9. Unity of Science

Lange, Chapters 7, 8

10. Reduction

Nickles, "Two Concepts of Intertheoretic Reduction"

Hendry, "Is There Downward Causation in Chemistry?"

11. Laws

Cartwright, "The Truth Doesn't Explain Much"

Cartwright, "Do the Laws of Physics State the Facts?"

12. Models and Idealization

Morrison, *Reconstructing Reality: Models, Mathematics, and Simulations*, Chapter 1

13. Metaphysics

Ladyman et al., *Everything Must Go*, Chapter 1