PHIL-UA 94/PHYS-UA 190 Course Syllabus (Spring 2016)

Philosophy of Physics

Conceptual Foundations of Space and Time

Section 001: MW 9:30–10:45 PM (TISC LC9)

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Office Hours: Thursdays 1–3 PM

OVERVIEW: This course will examine the roles of space, time, and motion in physical theorizing, and various puzzles and questions associated with those concepts. Among the questions we’ll investigate are: Do space and time (or spacetime) exist in the same sense as material objects? Are there objective facts about the geometry of physical space, or are they in some way conventional? Does time (unlike space) ‘pass’ or ‘flow’ in a particular direction, such that only the present moment is real? And is time travel possible, conceptually and physically? Indeed, how do the considerations relevant to addressing these questions change as we move from Newtonian physics to the modern spacetime frameworks of special and general relativity? No background in physics or philosophy is presupposed, but you should be prepared to engage with material from both disciplines.

PREREQUISITE: One introductory philosophy course.

REQUIRED TEXTS: The following texts have been ordered for the course:

(ISBN: 0-226-28864-1)


(ISBN: 978-0-691-14309-5)

(ISBN: 0-520-02433-8)

Additional readings will be available online at the course site.

COURSE REQUIREMENTS: Requirements for the course are three medium-length papers (5–7pp.), a final exam, and regular participation and attendance in both lecture and recitation. Papers will be due in class on the following dates: 9 March, 18 April, and 9 May. Each component of the course (three papers, final exam, attendance and participation) will count for 20% of your final grade. Please note that you must complete all assignments in order to pass the course.

You must sign up for one of the following recitation times, which will be run by Dan Hoek: Fridays 11:00 AM – 12:15 PM and 12:30 PM – 1:45 PM.
ACADEMIC HONESTY: The NYU Honor Code is in effect for this class. I take plagiarism and other forms of academic dishonesty very seriously. Violations automatically result in a failing grade for the entire course (not simply the assignment) and a referral to the Committee on Student Discipline. It’s your responsibility to familiarize yourself with the following University website (and links therein): http://cas.nyu.edu/page/academicintegrity. If questions arise as to what constitutes plagiarism, please ask me.
OUTLINE OF SCHEDULE

Specific readings will be assigned in class, and will include a subset or superset of this list.

27 Jan.: Introduction. What is the philosophy of spacetime physics?

SPACE, TIME, AND MOTION IN CLASSICAL PHYSICS

1 Feb.: The Nature of Instantaneous Motion
Central readings:
Huggett, pp. 31–37, 48–50 (selections from Plato, Simplicius, Aristotle)

3 Feb., 8 Feb.: The (Apparent) Metaphysical and Geometrical Underpinnings of Newton’s Laws
Central Readings:
Maudlin, pp.1–16, 24–34
Huggett, pp.107–126 (Newton)
Geroch, pp.3–36

10 Feb., 15 Feb.: The Leibniz/Clarke Correspondence
Central Readings:
Huggett, pp.143–159 (Leibniz, Clarke)
Maudlin, pp.34–43

(17 Feb.: no class – Presidents’ Day)

22 Feb.: Newton’s Bucket
Central Readings:
Maudlin, pp.17–24
Sklar, pp.182–193
24 Feb., 29 Feb., 2 March: Relationalism and Its Discontents

Central Readings:
Huggett, pp.169–181 (Berkeley, Mach)
Sklar, pp.169–173, 194–202
Maudlin, pp.43–46

7 March: Incongruent Counterparts

Central Readings:
Huggett, pp.197–203 (Kant)

9 March, 21 March: Neo-Newtonian Spacetime

Central Readings:
Sklar, pp.202–206, 225–234
Maudlin, pp.47–66
Geroch, pp.37–52

(14 March, 16 March: no class – Spring Break)

23 March, 28 March: The Epistemology of Physical Geometry

Central Readings:
Huggett, pp.213–221, 235–241 (Kant, Poincaré)
30 March: The Geometry of Minkowski Spacetime

Central Readings:
Maudlin, 67–76, 83–87
Sklar, pp.56–61
Geroch, pp. 67–112

4 April: Experimental Motivations, Simultaneity, Conventionality

Central Readings:
Sklar, pp.244–272, 276–294
Geroch, pp.53–63, 113–158
Maudlin, pp.77–83, 87–105

6 April: Bell’s Puzzle

Central Readings:
Maudlin, pp.106–125
Sklar, pp.294–296

11 April: Is Geometrical Structure Explanatory?

Central Readings:
Pooley 2015. “Substantivalist and Relationist Approaches to Spacetime”, in The Oxford Handbook of Philosophy of Physics (Batterman, ed.), section 6.3.2.
Balashov and Janssen 2003. “Presentism and Relativity”, British Journal for the Philosophy of Science, sections TBD.

13 April: The Status of Energy and Mass in Special Relativity

Central Readings:
18 April, 20 April: What’s ‘Real’ in a Relativistic World?

Central Readings:

SPACETIME FOUNDATIONS OF GENERAL RELATIVITY

25 April, 27 April: Curved Spacetime, Black Holes, and Time Travel

Central Readings:
Maudlin, pp.126–146, 154–169
Sklar, pp.27–54, 62–64, 66–78
Geroch, pp. 159–185

2 May: The Nature of the Metric and Other Metaphysical Enigmas

Central Readings:
Norton 2015, “What Can We Learn about the Ontology of Space and Time from the Theory of Relativity?”, in Physical Theory: Method and Interpretation (Sklar, ed.), Oxford University Press, sections TBD.
Brown, Physical Relativity, Oxford University Press, sections TBD.

4 May, 9 May: The Hole Argument

Central Readings:
Maudlin, pp.146–151