

Introduction to the Philosophy of Physics

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Class schedule: Thursdays 10-12, Les Philosophes 206
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This course offers an introduction to the philosophy of physics, which deals with methodological, epistemological, and metaphysical issues in physics. It consists of seven modules offering a rich menu in philosophically deep questions arising in modern physics, concentrating on space and time in classical physics and in special and general relativity (and beyond), and quantum mechanics, the measurement problem and quantum non-locality:

1. Organization and introduction: what is philosophy of physics, what are physical theories, and what is determinism?
2. Substantivalism vs relationalism: Newton, Leibniz, Kant, and time in Newtonian physics in general
3. Time in special relativity: relativity of simultaneity, Minkowski spacetime, and implications for the metaphysics of time
4. Time in general relativity, cosmology, and beyond
5. Moving backward and forward in time: time travel in modern physics
6. Quantum mechanics: phenomena and theory
7. Quantum mechanics: the measurement problem and quantum non-locality

Accessibility and Prerequisites. This course will be self-contained and has no prerequisites. While some background in physics, mathematics, and philosophy will be helpful, I will not assume any specific knowledge beyond high school mathematics.

This course will be conducted entirely in English. I plan to be giving lectures throughout, even though there will be the possibility of giving presentations in case someone needs them to obtain credit.

Recommended texts

- Nick Huggett. *Everywhere and Everywhen: Adventures in Physics and Philosophy*. Oxford University Press (2010).
- Readings are available at Moodle at <https://moodle.unige.ch/course/view.php?id=16525>.

Course requirements and evaluation

If this seminar is taken for credit, please let me know. For credit in philosophy you will have to fulfill requirements, depending on the module for which you are taking this course:

- BA7, module 7:
 - Evaluation: petit mémoire en philosophie dactylographié (30 à 40 pages, 60'000 à 80'000 signes, espaces non-compris) sur un sujet en relation avec un CR ou SE ou sur un sujet soumis et approuvé par un enseignant du Département de philosophie qui supervise le travail, et soutenance orale d'environ 30 minutes.
- MA2, demi-module 2b, or MA5, demi-module 5b:
 - Attestation: travail écrit de 12 pages d'environ 24'000 signes; ou présentation orale et complément écrit.
 - Evaluation: examen oral (env. 45 min.) portant sur le contenu du CR ou du SE et sur le travail du séminaire.

Contact me if you need credit in another programme.

Tentative schedule

Readings: for each session, the listed readings must be read in advance; the readings with an asterisk are background reading. Each of the modules will be covered in approximately 4 lessons.

Date	Topic and reading assignments
22 Feb	Organisation, introduction <i>Huggett, Ch 1, * Wüthrich (2011)</i>
29 Feb	Substantivalism vs relationalism <i>Huggett, Ch 9 (and * Ch. 16 for Kant's argument)</i>
7 March	Substantivalism vs relationalism <i>*Hoefler, Huggett, and Read (2021). Stanford Encyclopedia</i>
14 March	Time in special relativity <i>Huggett, Ch 14</i>
21 March	Time in special relativity <i>Huggett, Ch 15, * Janssen (2014)</i>
28 March	Time in general relativity, cosmology, and beyond <i>Maudlin (2012), Ch 6</i>
4 April	No seminar (semaine de lecture)
11 April	Moving backward and forward in time <i>Huggett, Ch 12 and 13, * Lewis (1976), * Arntzenius and Maudlin (2002)</i>
18 April	Quantum mechanics: phenomena and theory <i>Maudlin (2019), Ch 1</i>
25 April	Quantum mechanics: phenomena and theory <i>* Albert (1992), Ch1 and 2, * Ismael (2020), Stanford Encyclopedia</i>
2 May	Quantum mechanics: the measurement problem and quantum non-locality <i>* Maudlin (1995)</i>
9 May	Ascension Day
16 May	Quantum mechanics: the measurement problem and quantum non-locality <i>Mermin (1985)</i>
23 May	Special programme (conference)