# Philosophy of Physics

PHL 356, Winter 2018

<pre>time: Wednesdays, 9:00am - 12:00pm instructor: Michael Miller email: mike.miller@utoronto.ca office: JHB 514 office hours: TBD website: http://individual.utoronto.ca/michael_miller/courses/pp_w1</pre>	room:	OISE 8170
<pre>instructor: Michael Miller email: mike.miller@utoronto.ca office: JHB 514 office hours: TBD website: http://individual.utoronto.ca/michael_miller/courses/pp_w1</pre>	time:	Wednesdays, 9:00am - 12:00pm
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website: http://individual.utoronto.ca/michael_miller/courses/pp_w1	office hours:	TBD
	website:	http://individual.utoronto.ca/michael_miller/courses/pp_w18

### Course overview

The recent discovery of the Higgs Boson marked a final step in the empirical verification of the Standard Model of particle physics, our best theory of the fundamental forces and the elementary particles that experience them. This course will discuss philosophical issues associated with the theoretical and experimental challenges posed by the Standard Model. We will discuss special relativity and quantum mechanics and how they revolutionized our understanding of space, time, and matter. We will then discuss how these theories are combined in the Standard Model and the peculiar picture of the world that emerges from this synthesis. Along the way we will address philosophical questions concerning scientific realism and the nature of the knowledge that is generated by the enormous experiments that are required to test the Standard Model. This course will be accessible for those with no background in physics but with an interest in the philosophical challenges that modern physics poses.

#### Texts

The following texts are required for purchase and are available at the bookstore. All other required readings will be made available on the course website.

- Albert, David. Quantum Mechanics and Experience. Harvard University Press.
- Hacking, Ian. Representing and Intervening: Introductory Topics in the Philosophy of Natural Science. Cambridge University Press.

#### Assessment

You will be assessed on the basis of four homework assignments, and take-home midterm and final short essay exams (exact dates TBD). Detailed criteria for the evaluation of your writing will be discussed in class. *Late work will only be accepted in well-documented exceptional circumstances*. Your final grade will be determined by the following weighting:

- 40% homework (10% each) 30% midterm exam
- 30% final exam

### Class schedule

This schedule is subject to revision. An up-to-date schedule will be kept on the course website.

Date	Topic	Reading	HW Due
Jan 10	Introduction	Albert, Kraus	
Jan 17	Why philosophy of Science?	Weinberg, Redhead	
Jan 24	SR I & Realism I	Norton, Weinberg Ch. 1-2	
Jan 31	SR II & Realism II	Norton, Hacking Intro. & Ch. 1-2	
Feb 7	QM I & Realism III	Albert Ch. 1, Hacking Ch 5-6 & 8	HW1 due
Feb 14	QM II & Anti-realism I	Albert Ch. 2, Laudan	
Feb 21	Reading Week	No Class	
Feb 28	QM III & Anti-Realism II	Albert Ch. 3, van Fraassen	HW2 due
Mar 7	QM IV & Experiment I	Albert Ch. 4, Franklin	
Mar 14	QFT I & Experiment II	Feynman Ch. 3-4, Hacking Ch. 9-10	HW3 due
Mar 21	QFT II & Experiment III	Randall, Hacking Ch. 13 & Ch. 16	
Mar 28	QFT III & Experiment IV	Pickering Ch. 1 & Ch. 14	HW4 due
Apr 4	BSM & Review	Ellis, Ellis and Silk	

## Academic integrity

The University of Toronto's Code of Behaviour on Academic Matters outlines the behaviours that constitute academic misconduct, the processes for addressing academic offences, and the penalties that may be imposed. You are expected to be familiar with the contents of this document. All suspected cases of academic dishonesty will be investigated following the procedures outlined in the Code of Behaviour on Academic Matters. If you have any questions about what is or is not permitted in this course, please do not hesitate to contact me.

### Accommodation for disabilities

Students with diverse learning styles and needs are welcome in this course. If you have a disability or health consideration that may require accommodations, please approach Accessibility Services as soon as possible at the beginning of the term. I will make every effort to make appropriate accommodations.