

WESTERN UNIVERSITY
DEPARTMENT OF PHILOSOPHY
Undergraduate Course Outline 2020-21

Philosophy 2032F:
Einstein for Everyone

Fall Term
Online Asynchronous

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DESCRIPTION

This course considers the work of Albert Einstein and its impact, focusing mainly on the theories of relativity and cosmology. Mathematics will be kept to a minimum, and no physics background will be assumed. The course starts with special relativity, as formulated by Einstein in 1905. We will discuss Einstein's two postulates and explore their strange consequences for the behavior of measuring rods and clocks, and explain the meaning and importance of the relativity of simultaneity. How did Einstein discover special relativity? We will look at the historical context of his work, showing how it related to 19th century physics. We will also consider various consequences of the theory, such as $E = mc^2$, and alleged paradoxes (such as the twin paradox). We then turn to Einstein's most striking achievement, the general theory of relativity (1915). This theory is based on the remarkable idea that spacetime is curved. We will develop the background needed to understand this concept and the other basic ideas of the theory, and consider consequences of the theory related to cosmology and black hole physics. We will also consider Einstein's innovative path to general relativity as exemplifying an effective critical analysis of a physical theory.

READINGS

The primary textbook for the course is an online book by John D. Norton, *Einstein for Everyone*. We will also read parts of the following papers and books, all posted to the OWL website:

1. Einstein (1905), "On the Electrodynamics of Moving Bodies" (translation by John Walker).
2. Appendix on special relativity, by Michel Janssen (from the *Cambridge Companion to Einstein* (2014)).
3. Selection from I. B. Cohen, *The Birth of a New Physics*.
4. Selections from Einstein, "On the Relativity Problem" (1914)
5. "Einstein's Role in the Creation of Relativistic Cosmology," by Chris Smeenk (from the *Cambridge Companion to Einstein*).
6. Selections from the correspondence between Einstein and De Sitter (from the *Collected Papers of Albert Einstein, Volume 8*).
7. Selections from *The First Three Minutes*, by Steven Weinberg (1977).
8. Selections from *Cosmology for the Curious*, by Delia Perlov and Alex Vilenkin (2017).

SCHEDULE

Week	Topic	Written Assessment
	Module 1: It's About Time	
Sept. 8	Relativity and Light	Forum Post
Sept. 13	Simultaneity for Distant Events	Compair 1
Sept. 20	Spacetime	Forum Post
Sept. 27	Implications of Relativity	Compair 2
	Module 2: Gravity as Curved Spacetime	
Oct. 4	Geometries	Forum Post
Oct. 12	Einstein's Path to a New Theory	Compair 3
Oct. 18	General Relativity 101	Midterm Exam
Oct. 25	Was Einstein Right?	Forum Post
Nov. 1	<i>Fall Reading Week</i>	
	Module 3: Einstein's Cosmos	
Nov. 8	Rough and Winding Road to Cosmology	Compair 4
Nov. 15	The Big Bang Theory and Black Holes	Forum Post
Nov. 22	Cosmology's Dark Materials	Compair 5
Nov. 29	Concluding Reflections: Einstein as a Philosopher	Final Essay (due Dec. 8)
Date to be determined	Final Exam	

COURSE-LEVEL LEARNING OUTCOMES

By the end of the course students will be able to:

1. Demonstrate they understand the physical concepts introduced by Einstein and how these concepts apply to the world.
2. Characterize the problems Einstein confronted, and how he resolved them by rethinking basic concepts with his distinctively "philosophical" approach to science.
3. Perform critical reflection on how modern physics impacts our understanding of the universe and our place in it.
4. Improve analytical skills to critically assess science (in different senses), and to present these ideas in writing.
5. Apply critical reflection on the development of science and the impact of dramatic changes in our understanding, based on Einstein's work as a case study.

ASSESSMENT

1. Regular formative assessments (15 %): (i) short questions, polls, and quizzes (5 %). These formative assessments will help give you and me a sense of how well you are understanding key concepts as they are introduced. (ii) Critical reflections (5 %): each week you will write a brief response to the material we have covered, answering three questions: “what,” “so what,” and “now what”? (iii) Discussion forum posts (5 %), roughly biweekly according to the schedule above.
2. Short writing assignments (15 %): peer-reviewed short essay writing (Compair). These will be roughly bi-weekly, as indicated above, and focus on developing writing skills for the final paper.
3. Exams (35 %): midterm (15 %) and final exam (25 %), consisting of short answer (multiple choice, T / F, etc.) and essay questions, to be completed in 24 hour period. A more detailed description of the exam, and sample questions, will be distributed at least two weeks prior to the exam.
4. Final Essay (35 %): 2000-2500 word final essay, due at the end of the term. A grading rubric and guidelines will be posted well in advance of the essay due date.

AUDIT

Students wishing to audit the course should consult with the instructor prior to or during the first week of classes.

DEPARTMENT OF PHILOSOPHY POLICIES

The **Department of Philosophy Policies** which govern the conduct, standards, and expectations for student participation in Philosophy courses is available in the Undergraduate section of the Department of Philosophy website at <http://uwo.ca/philosophy/undergraduate/policies.html>.

It is your responsibility to understand the policies set out by the Senate and the Department of Philosophy, and thus ignorance of these policies cannot be used as grounds of appeal.

ACCOMMODATION

Students seeking academic accommodation on medical grounds for any missed tests, exams, participation components and/or assignments worth 10% or more of their final grade must apply to the Academic Counselling office of their home Faculty and provide documentation. Academic accommodation cannot be granted by the instructor or department. Documentation shall be submitted, as soon as possible, to the Office of the Dean of the student's Faculty of registration, together with a request for relief specifying the nature of the accommodation being requested.

The UWO Policy on Accommodation for Medical Illness and further information regarding this policy can be found at

http://uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf.

SELF- REPORTED ABSENCE FORM

Students who experience an unexpected illness or injury or an extenuating circumstance (48 hours or less) that is sufficiently severe to temporarily render them unable to meet academic requirements (e.g., attending lectures or labs, writing tests or midterm exams, completing and submitting assignments, participating in presentations) should self-declare using the online Self-Reported Absence portal. This option should be used in situations where the student expects to resume academic responsibilities within 48 hours or less.

The following conditions are in place for self-reporting of medical or extenuating circumstances:

http://westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#SubHeading_322

EVALUATION OF ACADEMIC PERFORMANCE

At least three days prior to the deadline for withdrawal from a course without academic penalty, students will receive assessment of work accounting for at least 15% of their final grade. For 3000- or 4000-level courses in which such a graded assessment is impracticable, the instructor(s) must obtain an exemption from this policy from the Dean and this exemption must be noted on the corresponding course syllabus. In rare instances and at the Dean's discretion, other courses could receive a similar exemption, which also must be noted in the course syllabus.

COURSE ASSIGNMENT

The last day of scheduled classes in any course will be the last day on which course assignments will be accepted for credit in a course. Instructors will be required to return assignments to students as promptly as possible with reasonable explanations of the instructor's assessment of the assignment.

ACADEMIC OFFENCES

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

PLAGIARISM CHECKING

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com <http://www.turnitin.com>.

SUPPORT SERVICES

Registrarial Services <http://www.registrar.uwo.ca>

Student Support Services <https://student.uwo.ca/psp/heprdweb/?cmd=login>

Services provided by the USC <http://westernusc.ca/services/>

Student Development Centre <http://www.sdc.uwo.ca/>

Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> for a complete list of options about how to obtain help. Immediate help in the event of a crisis can be had by phoning 519.661.3030 (during class hours) or 519.433.2023 after class hours and on weekends.

ONLINE ETIQUETTE

Some components of this course will involve online interactions. To ensure the best experience for both you and your classmates, please honour the following rules of etiquette:

- please "arrive" to class on time

- please use your computer and/or laptop if possible (as opposed to a cell phone or tablet)
- ensure that you are in a private location to protect the confidentiality of discussions in the event that a class discussion deals with sensitive or personal material
- to minimize background noise, kindly mute your microphone for the entire class until you are invited to speak, unless directed otherwise
- In order to give us optimum bandwidth and web quality, please turn off your video camera for the entire class unless you are invited to speak
- unless invited by your instructor, do **not** share your screen in the meeting

The course instructor will act as moderator for the class and will deal with any questions from participants. To participate please consider the following:

- if you wish to speak, use the “raise hand” function and wait for the instructor to acknowledge you before beginning your comment or question
- remember to unmute your microphone and turn on your video camera before speaking
- self-identify when speaking.
- remember to mute your mic and turn off your video camera after speaking (unless directed otherwise)

General considerations of “netiquette”:

- Keep in mind the different cultural and linguistic backgrounds of the students in the course.
- Be courteous toward the instructor, your colleagues, and authors whose work you are discussing.
- Be respectful of the diversity of viewpoints that you will encounter in the class and in your readings. The exchange of diverse ideas and opinions is part of the scholarly environment. “Flaming” is never appropriate.
- Be professional and scholarly in all online postings. Cite the ideas of others appropriately.

Note that disruptive behaviour of any type during online classes, including inappropriate use of the chat function, is unacceptable. Students found guilty of Zoom-bombing a class or of other serious online offenses may be subject to disciplinary measures under the Code of Student Conduct. [Code of Student Conduct](#)