

Philosophy of Space and Time

Homer Summer 21'

Instructor: Jingyi Wu

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Tentative syllabus, the instructor reserves the right to change any part of this syllabus

Course Description

What is space? What is time? How does space differ from time? How do we psychologically experience space and time? How do we geometrically represent space and time in physics? Do our psychological experiences of space and time align with what our best physical theories say? Is time travel possible? What are the paradoxes of time travel? What can time travelers do, and what can't they do? Does our conception of time travel change depending on the background physical theories we presuppose? Are there possible worlds? Are our best physical theories compatible with possible worlds? Will some of the paradoxes of time travel go away if there were possible worlds? In this course, we will try to answer all of the above questions (and more). Readings will be taken from literature, physics, and philosophy, including works by Jorge Luis Borges, Albert Einstein, and David Lewis.

Prerequisites

Knowledge of college level mathematics and physics is not required. Some familiarity with Newton's three laws of motion would be helpful, but not required.

Learning Goals

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

- (1) Comprehend and analyze the structures of philosophical essays;
- (2) Compose short philosophical argumentative essays;
- (3) Articulate their personal relationships with space and time in writing;
- (4) Understand major philosophical debates surrounding space, time, time travel, and possible worlds;
- (5) Have some conceptual grasp of Newtonian mechanics, special relativity, and quantum mechanics.

Reading Materials

All reading materials will be available on Perusall. Go to [Perusall.com](https://perusall.com) and make an account. Then enter the code XXXXXXXXXX to enroll in our virtual classroom.

For each session, you are **required** to make two comments on Perusall as you complete the readings, the comments can be questions (no matter how big or small) you have on the readings, or responding to other students' thread. Alternatively, if you complete the readings off-line, you can instead send two questions to me prior to our class. This needs to be completed 1 hour before our class starts.

Please complete the readings for each session before the session starts.

Descriptions of selected reading materials:

Einstein's Dreams is a novel written by physicist Alan Lightman (MIT), consisting of 30 short chapters, each exploring one dream about time that the fictional Einstein had when he worked on the theory of relativity.

Many other readings will be taken from aeon.co, a digital magazine dedicated to promoting profound philosophical and scientific thinking in an accessible way.

Zoom

We will be meeting over zoom. Please go to <https://zoomcloud.cn/download> to install Zoom on your computer if you don't have the app already. Our meeting ID is [REDACTED]. You can also access the meeting via our meeting link: [REDACTED].

Schedule

Section 1: What is Time? How does Time Differ from Space?

Session 1 July 15 9-11 AM General Introduction

Reading:

Borges, "The Garden of Forking Paths" ~10 pp

Session 2 July 15 12: 30 PM- 2:30 PM Writing Workshop #1

Readings: none

How to read, write, and think about philosophy? (in-class discussion: the Ship of Theseus)

Session 3 July 16 9-11 AM Past, Present, Future

Reading:

Farr, ["The ABC of Time"](#)

"22 June 1905" and "10 May 1905" in *Einstein's Dreams*

Session 4 July 16 12: 30 PM- 2:30 PM (Dis)analogies between time and space

Reading:

Taylor, "Spatial and Temporal Analogies and the Concept of Identity" ~15 pp*

"14 May 1905" in *Einstein's Dreams*

Section 2: The Physics of Space and Time

Session 5 July 17 9-11 AM Leibniz, Clarke, and Du Chatelet on Time

Reading:

Leibniz-Clarke correspondence, [Clarke §2.1 & Leibniz §§3.1-8](#) ~4 pp

Du Chatelet, *Foundations of Physics*, Ch. 6 "Of Time" ~9 pp

Writing Assignment #1 due on July 17, 12 PM

Session 6 July 17 12: 30 PM- 2:30 PM Writing Workshop #2

Readings: none

Introduction to Critical Reasoning

Session 7 July 18 9-11 AM Newton and the Classical Spacetime Theories

Reading:

Weatherall, [“Classical Spacetime Structure”](#) ~20 pp*
Jingyi Wu, handout

Session 8 July 18 12: 30 PM- 2:30 PM Special Relativity, the Relativity of Simultaneity

Reading:

Einstein, [Relativity: The Special and General Theory §§8-10](#) ~11 pp*

“20 June 1905” in *Einstein’s Dreams*

Session 9 July 19 9-11 AM General Relativity, the Relativity of Simultaneity

Reading:

Rovelli, “First Lesson,” *Seven Brief Lessons on Physics*

Rovelli, “Now Means Nothing,” *The Order of Time*

“26 April 1905” in *Einstein’s Dreams*

Section 3: Time Travel

Writing Assignment #2 due on July 19, 12 PM

Session 10 July 19 12: 30 PM- 2:30 PM Writing Workshop #3

Individual Meetings Regarding Final Project (Topic Assigned)

Session 11 July 21 9-11 AM Story of Your Life

Reading:

Chiang, [“Story of Your Life”](#) ~39 pp*

Session 12 July 21 12: 30 PM- 2:30 PM Time Travel

Reading:

Lewis, [“Paradoxes of Time Travel”](#) ~7 pp double column

“24 April 1905”, *Einstein’s Dreams*

Session 13 July 22 9-11 AM Limits of Time Travel

Reading:

Vihvelin, “What Time Travelers Cannot Do” ~15 pp

“14 April 1905” in *Einstein’s Dreams*

Session 14 July 22 12: 30 PM- 2:30 PM Writing Workshop #4

Individual Meetings Regarding Final Project

Individual feedback on previous assignments

Session 15 July 23 9-11 AM The Arrow of Time

Reading:

North, [“Time in Thermodynamics”](#) pp 1-17*

“3 May 1905”, and “11 May 1905” in *Einstein’s Dreams*

Section 4: Possible Worlds and Branching Universes

Draft of Final Project due on July 23, 12 PM

Session 16 July 23 12: 30 PM- 2:30 PM Possible Worlds

Reading:

Borges, “The Library of Babel” ~9 pp

Session 17 July 24 9-11 AM Multiverse

Reading:

Crumey, [“Parallel worlds”](#)

Session 18 July 24 12: 30 PM- 2:30 PM Writing Workshop #5

Individual workshop on Final Project Draft

Session 19 July 25 9-11 AM The Many Worlds Interpretation of Quantum Mechanics

Reading:

Carroll, [“Splitting the Universe”](#)

Session 20 July 25 12: 30 PM- 2:30 PM Wrap Up; Final Presentations

Final Project due on July 27, 12 PM

Assignments and Assessment

There will be two short writing assignments (200-300 words), and one long assignment (600-1000 words).

Writing Assignment (WA) #1:

This is a free writing exercise. Follow the two steps below:

- (1) Writing phase: set a timer for 20 minutes and respond to the following prompt. The only requirement for this step is that you write **continuously**. That is, your pen and pencil cannot leave your paper for more than 1 second (if you’re writing on paper), and your fingers cannot leave your keyboard for more than 1 second (if you’re typing). You do not have to answer all of the questions in the prompt. Start with some of the questions and see where your mind takes you.

Prompt: What is space? What is time? How do *you* experience space? How do *you* experience time? How do your experiences of time and space differ? What is your relationship with timepieces? Do you keep a watch? Do you use alarm clocks? Do you like using them? Why or why not? Does time flow through you or do you flow through time? Similarly, what is your relationship with distance measurement devices like rulers? Do you have one of these? How often do you use them? Do you like using them? Why or why not? Does space flow through you or do you flow through space? I’ll ask again: How do your experiences of time and space differ?

- (2) Editing phase: set a timer for 20 minutes and edit what you have written into 200-300 words. The only requirement for this step is that you **cannot** add more words, but you can **delete words** and **rearrange sentences**. Good luck.

Optional: If you wish, you can video tape your entire free writing process in addition to submitting the writing assignment.

WA #2:

This is a **four-sentence** philosophical essay exercise, aimed at cultivating your **critical reasoning** skills. Pick a philosophical essay or paper that we have read, your goal is to (1) identify the main argument that the author defends; (2) respond to the author's main argument by articulating your position in the debate; (3) anticipate a possible objection to *your* position; (4) respond to the possible objection.

If you have trouble structuring the four sentences, you can follow the following template:

- (1) [The author] says _____.
- (2) I say _____, because _____.
- (3) One might object that _____.
- (4) I reply that _____.

There is no word limit for this writing assignment, but your essay cannot exceed 4 sentences.

Final Project:

You can choose to write whatever you want in (about) 600-1000 words. Here are some possibilities that you might consider:

- (1) Write a philosophical essay that uses the skills you learned in WA #2. Now, instead of one sentence, you can spend one paragraph on each of the four components.
- (2) Create a piece of artwork related to the topics discussed in the course. If you choose this option, please also submit a 200-300 words discussion/analysis of your artwork.
- (3) have so far read many entries in *Einstein's Dreams* as well as read some of Einstein's own writings. Now compose a dream about time that the fictional young Einstein might have had. Have fun!
- (4) Write a personal essay inspired by some of the philosophy and physics we learned through the course.
- (5) Write a blog post introducing some of the philosophy and physics materials that we learned through the course.
- (6) Watch a movie or TV series related to the materials in this course and write an essay on how the movie relates to the readings (ask the instructor for recommendations).
- (7) Respond to the following prompt: would you choose to read the story of *your* life? Why or why not?

Final Presentation:

For our very last meeting, you will be asked to do a 5-8 min presentation on your final project. Among other things, you can talk about why you choose the topic, what did you do in the project, and what have you learned.

Assessment:

Your grade will depend on your informed and active class participation and the quality of your writing assignments. Here is the breakdown:

Informed and active class participation (20%)

Informed and active class participation can come in different forms, such as active speaking in class, active listening to the instructor and your classmates, active engagement with the reading materials, active reflections, etc. Since some of the informed and active class participation might be invisible to me, towards the end of the course, I will ask you to submit your own participation grade, along with a short (~100-200 words) justification of why you think you deserve the grade you submit. If I agree with your justification, I will give you the participation grade you submit.

WA #2 (20%)

Final Project (40%)

Final Presentation (20%)

WA #1 will not be graded. It is designed to help you start thinking and writing. However, if you do not complete WA #1, your participation grade will be lowered.