

Philosophy of Space and Time

Christopher Arledge

UMBC Fall 2021

Course Details

Email: carledge@umbc.edu

Course Number: PHIL 427

Time: TTh 2:30-3:45 p.m.

Room: PAHB 456

Office Hours: Tuesday 1:00pm - 2:00pm

Office: PAHB 467

Course Description

An investigation into the philosophical implications of modern spacetime theories. Topics include the paradoxes of relativity of simultaneity, the reality of space and time in special and general relativity, the metaphysics of time, temporal perception, time travel and will conclude with a brief look at cutting edge work on black holes and cosmology. Emphasis will be placed on philosophical issues rather than mathematical rigor. No prior background in college mathematics or physics will be presupposed, but a familiarity with high-school algebra will be necessary. The minimal relevant physics will be taught along the way.

Learning Goals

By the end of this course students should:

1. Have a basic grasp of modern spacetime theories, in particular special and general relativity.
2. Be able to explain the interrelation between physics and philosophy.
3. Be able to articulate some of the main philosophical problems facing modern spacetime theories.
4. Have the ability to pursue future research in philosophy of physics, should they desire to.

Readings

Required Texts

Dainton, Barry. (2010). *Time & Space*. Montreal: McGill.

Geroch, Robert. (1978). *General Relativity from A to B*. Chicago: University of Chicago Press.

Mermin, David. (2005). *It's About Time*. Chambersburg: Ingram Publishing.

Additional readings will be distributed electronically.

Useful Secondary Texts

Einstein, Albert. *Relativity: The Special and General Theory*. Princeton University Press, 2015.

Friedman, Michael. *Foundations of Spacetime Theories*. Princeton University Press, 1989.

Malament, David. *Topics in the Foundations of General Relativity and Newtonian Gravitation Theory*. University of Chicago Press. 2012.

Maudlin, Tim. *Philosophy of Physics: Space and Time*. Princeton University Press, 2012.

Sklar, Lawrence. *Space, Time and Spacetime*. University of California Press, 1977.

Requirements

Term Paper Proposal (20%) - Students will be required to submit a term paper proposal that outlines the topic and some potential readings. More details and a template will be given on the first day of class.

Term Paper (50%) - Students will be required to submit a 10-12 page research paper on a topic of their choosing. This will be due on the day the final is scheduled. Specifics will be given during the first meeting.

Presentation (30%) - Students will be required to give a 10 minute presentation on their selected topic. The presentation is expected to be well prepared, including a PowerPoint or a handout for listeners to follow.

Classroom Policies

Attendance - There will be no formal attendance requirement, but students are expected to attend. Discussion is a vital part of this course.

Technology - The use of laptops and tablets is permitted on the condition that they are used for class purposes. Using a device for a non-class related purpose will distract you, and those around you, so please don't be rude and wait until after class to browse.

Schedule

This is a very rough outline of a schedule. The actual schedule will depend on your interests and how the discussion proceeds.

1. Classical Space and Time in Galileo, Newton and Leibniz (2 weeks)
2. Special Relativity (~1 month)
3. General Relativity (~ 1 month)
4. Philosophy of Time (~ 2-3 weeks)
5. Cosmology and Quantum Gravity (~ 1 week)
6. Presentations (1 week)

From the University

UMBC Statement of Values for Academic Integrity

By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to, suspension or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, or the Office of Undergraduate Education.

Disclosures of Sexual Misconduct and Child Abuse or Neglect

As an instructor, I am considered a Responsible Employee, per UMBC's Policy on Prohibited Sexual Misconduct, Interpersonal Violence, and Other Related Misconduct. While my goal is for you to be able to share information related to your life experiences through discussion and written work, I want to be transparent that as a Responsible Employee I am required to report disclosures of sexual assault, domestic violence, relationship violence, stalking, and/or gender-based harassment to the University's Title IX Coordinator.

As an instructor, I also have a mandatory obligation to report disclosures of or suspected instances of child abuse or neglect (www.usmh.usmd.edu/regents/bylaws/SectionVI/VI150.pdf). The purpose of these reporting requirements is for the University to inform you of options, supports and resources; you will not be forced to file a report with the police. Further, you are able to receive supports and resources, even if you choose to not want any action taken. Please note that in certain situations, based on the nature of the disclosure, the University may need to take action.

If you need to speak with someone in confidence about an incident, UMBC has the following Confidential Resources available to support you: The Counseling Center: 410-455-2472 University Health Services: 410-455-2542 (After-hours counseling and care available by calling campus police at 410-455-5555)

Other on-campus supports and resources: The Women's Center, 410-455-2714 Title IX Coordinator, 410-455-1606 Additional on and off campus supports and resources can be found at: <http://humanrelations.umbc.edu/sexual-misconduct/gender-equitytitle-ix/>.

Student Disability Services

UMBC is committed to eliminating discriminatory obstacles that may disadvantage students based on disability. Services for students with disabilities are provided for all students qualified under the Americans with Disabilities Act (ADA) of 1990, the ADAAA of 2009, and Section 504 of the Rehabilitation Act who request and are eligible for accommodations. The Office of Student Disability Services (SDS) is the UMBC department designated to coordinate accommodations that would allow students to have equal access and inclusion in all courses, programs, and activities at the University.

If you have a documented disability and need to request academic accommodations, please refer to the SDS website at sds.umbc.edu for registration information and to begin the process, or alternatively you may visit the SDS office in the Math/Psychology Building, Room 212. For questions or concerns, you may contact us through email at disAbility@umbc.edu or phone (410) 455-2459.

If you require accommodations for this class, make an appointment to meet with me to discuss your SDS-approved accommodations.