What is Nature? What do we know about it? What *can* we know about it? Physics is the art of describing how the natural world works, an art that began in antiquity and continues to this day. This course investigates the evolution of physics and how our physical theories have changed across the millennia. It examines how humanity's scientific view of Nature has been shaped by both theory and experiment. Designed as a cluster course for non-science majors, the course considers cultural, philosophical, and historical contexts through a wide selection of readings.

Schedule

Mondays & Wednesdays $900 - 1015$ B&L 315

If I ask the class questions, be prepared to respond with your thoughts. You may take notes on your computer, or by hand. Classes will focus on the history of physics, physical concepts, and a little on notation.

Feel free to bring coffee or breakfast, I know it's early. Clean up after yourself. Use the bathroom before class, but if you really need to go during class just get up and go without making a big disturbance.

Faculty

Professor: Damian Sowinski
Email: dsowinsk
Office: B&L 466
Hours: Tu 1100-1300

Syllabus

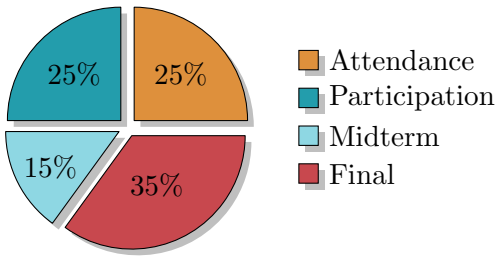
This is a living syllabus that will grow with the course, guided by class interests. Your participation is crucial in determining the directions we take.

Week 1	Escaping Superstition
1/21	*The Birth of Natural Philosophy from the Pre-Socratics to Plato* .....
1/23	*The Rise of Geocentrism from Aristotle and Erastosthenes* .....
Week 2	Imagining the Shape of the Universe
1/26	**Snow Day** .....
1/28	*The Geocentric Model is perfected by Ptolemy* .....
Week 3	Where is the Center of the Universe?
2/2	*Ptolemy's Almagest* .....
2/4	*Heliocentrism from Coopernicus to Kepler* .....
Week 4	The Mechanistic Universe
2/9	*Galileo and the Moons of Jupiter* .....
2/11	*Kepler's Law of Planetary Motion* .....
Week 5	The Mechanistic Universe II
2/16	*Newton's General Scholium* .....
2/18	*Newton's Laws of Motion* .....

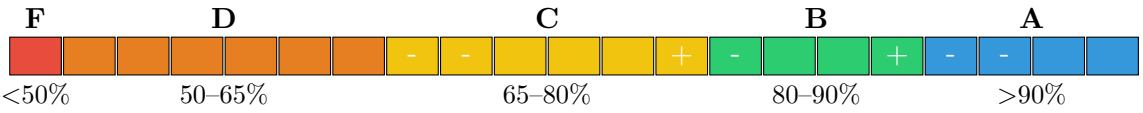
Week 6	Probability and Ignorance	
2/23	*Frequentist and Bayesian Interpretations of probability*	
2/25	*Phlogiston and Caloric Theories of Heat*	
Week 7	Thermodynamics	
3/2	*Rumford and Joule, the triumph of Kinetic Theory*	
3/4	**Midterm Exam**	
Week 8	Spring Break	
3/9	🛏	sleep
3/11	🛏	sleep more
Week 9	Logistical Tools	
3/16	*Overleaf & LaTeX Tutorial, Stack Exchange*	
3/18		
Week 10	Electric Phenomena	
3/23	*Gilbert to Coulomb, the first electric machines*	
3/25	*Visualizing the Electric Field*	
Week 11	Applied Mathematics	
3/30	*Scalars and Vectors, Visualizing fields, Sources and Sinks*	
4/1	*Orientable Surfaces, Boundaries, Flux*	
Week 12	Magnetic Phenomena	
4/6	*Visualizing Magnetic fields and forces, the Right Hand Rules*	
4/8	*Faraday and Ampere, Maxwell's Unification*	
Week 13	A History of Light, and the Rise of Relativity	
4/13	*Olber's paradox, Aether experiments and the end of Absolute Space*	
4/15	*Paradoxes in relativity and visualizing spacetime*	
Week 14	Spacetime and the Cosmos	
4/20	*Black holes, time machines, and wormholes*	
4/22	*The end of time*	
Week 15	The Quantum Revolution	
4/27		
4/29		

Grading Policy

Your grade for this course will be determined by attendance, participation, and two exams.



Your course grade corresponds to the percentage bracket below:



Attendance: Be in your seat when the scheduled class time begins, ready to participate.

Participation: Participation includes your weekly writing, reading quizzes, and discussions.

Midterm: The exam is on **March 11**, the Friday prior to Spring Break. It will cover material up to this week.

Final: The final time and location can be found at Final's Week Spring 2026. It will cover material from the entire semester, with more emphasis on the material presented after the midterm.

Readings

Scroll down to see a list of texts. The weekly readings will be populated depending on class interests. You will find each one in a folder on Blackboard. Files will become visible as they are added to the list.

Week 1

The Allegory of the Cave (6 pg) by Plato
The Library of Babel (7 pg) by Jorge Louis Borges
The Tower of Babylon (28 pg) by Ted Chiang

Week 2

June, ca. 240 B.C. Eratosthenes Measures the Earth (Link) by Alan Chodos
What Is The Geocentric Model Of The Universe? (Link) by Matthew Williams
Our Picture of the Universe (aBHoT, 12 pg) by Stephen Hawking
Classical Education, Science, and the West (tPCoN, 17 pg) by Werner Heisenberg

Week 3

Ptolemy's Almagest (Book 1, pg 35-47, 12 pg) translated by G. Toomer
On the Revolutions of Heavenly Bodies (Book 1, Ch 1-10, 25 pg) by N. Copernicus
Galileo's Letter to the Grand Duchess Christina (42 pg) translation Stillman Drake

Week 4

The Origins of the Mechanistic & Materialistic World-View (pgs 129-151) by W. Heisenberg
Smile (From Dance for Two, 3 pgs) by Alan Lightman

Week 5

General Scholium to Newton's Principia (3 pg) translation Andrew Motte

Week 6

Essay on Probabilities (Ch. 1&2, 10 pages) by Pierre Simone, marquis de Laplace
Exhalation (aBHoT, 16 pg) by Ted Chiang

Week 7

The Mechanical Equivalent of Heat (23 pg) by J.P. Joule,
June 1871: Maxwell and His Demon (Link) APS News

Week 8 & 9

Einstein's Dreams (51 pg, Optional) by Alan Lightman,

Week 10

July 1820: Oersted & Electromagnetism (Link) by Alan Chodos

Week 11

Week 12

The Merchant and the Alchemist's Gate (18 pg) by Ted Chiang
The Arrow of Time (aBHoT, 9 pg) by Stephen Hawking
Space and Time (aBHoT, 19 pg) by Stephen Hawking
Wormholes and Time Travel (aBHoT, 25 pg) by Stephen Hawking

Week 13

Black Holes (aBHoT, 17 pg) by Stephen Hawking
Black Holes Ain't So Black (aBHoT, 13 pg) by Stephen Hawking
The Expanding Universe (aBHoT, 16 pg) by Stephen Hawking
The Origin and Fate of the Universe (aBHoT, 25 pg) by Stephen Hawking
Cosmic Spring (9 pg) by Ken Liu

Week 14

The Uncertainty Principle (aBHoT, 9 pg) by Stephen Hawking

LaTeX and Overleaf

In this course you will be introduced to a powerful word processing suite called LaTeX. It has a steep learning curve, but once you start becoming adept at it you will NEVER have to worry about how to do references/citations ever again. Most of you will use it online at Overleaf. Head over to the site and make yourself an account using your UofR email to get started. Please read through the info page on LaTeX here.

Some of you may want to use LaTeX locally on your machine when not connected to the internet. You should download a distribution (MacTeX, LaTeX Project,TeX Live) if you plan on being away from internet access for long periods of time. Please read through the info page on LaTeX here.

Time Management

Time Investment: This Natural Science cluster course requires ∼6-10 hours weekly.

Reading:	3–5 hr	🕒🕒🕒 (🕒🕒)
Homework:	1–2 hr	🕒 (🕒)
Lectures:	2 hr	🕒🕒
Office hours:	1 hr	🕒

Success tips: Set alarms, use your calendar, don't procrastinate. Start readings early. Use office hours and recitation. You'll be reading/studying/learning 40+ hours weekly for all your courses, taking part in our collective quest for understanding. This isn't just coursework—it's your adventure to the edge of human knowledge!

Academic Honesty

Acquaint yourself with the UR Academic Honesty Policy. Cheating includes the submission of homework or exam solutions that are not your own work or under someone else's name. Any detected act of cheating will be handed over to the Board on Academic Honesty for investigation.

Artificial Intelligence You may use AI to explore ideas, but remember that it makes mistakes. Learn to use it, but question its output. Cross-reference what it says with other sources to determine accuracy. Any use of LLMs for writing assignments is considered academic dishonesty.

Statement of Inclusion

The University of Rochester, this course, and its teaching staff are committed to inclusion and welcome students of all backgrounds and abilities. Services and reasonable accommodations are available to students with temporary and permanent disabilities, to students with DACA or undocumented status, to students facing mental health issues, other personal situations, and to students with other kinds of learning needs. Please feel free to let any of us know if there are circumstances affecting your ability to participate in class or your full participation in this course. Some resources that might be of use include:

- International Student Academic Affairs
- University of Rochester's CARE network

Disability Resources

The University of Rochester respects and welcomes students of all backgrounds and abilities. In the event that you encounter any barrier(s) to full participation in this course due to the impact of a disability, please contact the Office of Disability Resources. The access coordinators in the Office of Disability Resources can meet with you to discuss the barriers that you are experiencing and explain the eligibility process for establishing academic accommodations. You can reach the Office of Disability Resources at disability@rochester.edu; (585) 276-5075; Taylor Hall; Website.

Mental Health Services

Managing your mental and physical health while keeping up with all your academic responsibilities may be especially challenging. The University offers support services in a variety of areas and has adapted to supporting students both in-person and online. We encourage you to review the services offered and reach out should you find yourself struggling. You can find a list of services, with descriptions, at this page.