

PHIL 1010: SCIENTIFIC REASONING (SPRING 2022)

Instructor	Brendan Shea, Ph.D.	Course number	PHIL 1010-71
Contact Info	Brendan.Shea@rctc.edu 507-722-1146	Prerequisites	None
Office	M2403Q	Class location	Online
Office hours	Mon 9-11 (in person) Wed 10-12 (Zoom)	Class time	Asynchronous

NOTE: CCO NOT FINALIZED.

Class Description. This class provides a philosophical and historical introduction to scientific reasoning, with a special emphasis on learning to think critically and methodically about everyday issues related to science. Students will learn to think carefully about what distinguishes science from non-science, the limits to scientific knowledge, and how science has changed over time. Along the way, they'll be introduced to a variety of important scientific ideas and debates, both current and historical. (3 credits).

OUTLINE OF MAJOR CONTENT AREAS

1. History and Philosophy of Science: Basic Concepts
 2. Scientific Knowledge and its Limits
 - a. Formal vs Empirical Theories
 - b. Inductive vs Deductive Reasoning
 3. Scientific Method
 4. How Science Makes Progress
 5. Distinguishing Science from Pseudoscience
 - a. Falsificationism and Testability
 - b. Scientific Paradigms
 - c. Other Criteria
 6. Scientific Worldviews
 - a. Aristotle through the Middle Ages
 - b. The "Scientific Revolution"
 - c. The Newtonian World
 - d. Darwin, Wallace, and Evolutionary Theory
 - e. Einstein, Bohr, and Modern Physics
 7. Contemporary Debates in History and Philosophy of Science
1. Distinguish between science and non-science.
 2. Explain how scientific theories are confirmed or falsified by observation.
 3. Apply principles of scientific reasoning to current problems.
 4. Describe how scientific theories have changed over time.
 5. Compare historically important scientific theories and evaluate the arguments for these theories.
 6. Use the principles of inductive and deductive logic to analyze the nature and import of scientific experiments.

LEARNING OUTCOMES (MnTC). Goal 2: Critical Thinking. Students will be able to:

1. Gather factual information and apply it to a given problem in a manner that is relevant, clear, comprehensive, and conscious of possible bias in the information selected.
2. Imagine and seek out a variety of possible goals, assumptions, interpretations, or perspectives which can give alternative meanings or solutions to given situations or problems.
3. Analyze the logical connections among the facts, goals, and implicit assumptions relevant to a problem or claim; generate and evaluate implications that follow from them.

LEARNING OUTCOMES (General). The student will be able to:

REQUIRED COURSE MATERIALS

All materials—including the course textbook listed below—will be available for free on the course D2L site.

- Hakob Barseghyan, Nicholas Overgaard, and Gregory Rupik. 2020. *Introduction to History and Philosophy of Science*. Press Books.
- Brendan's Lecture Notes (available on D2L).

Course Technology Requirements. The only technology required for this course are the ability to regularly access the course D2L site and Perusall sites, which should work with any computer (but which do require internet access). There are occasional (optional) Youtube videos, in the form of lectures that accompany our textbook. The final essay exam can be written using any standard office program (MS Word, Google Docs, etc.).

GRADING AND COURSE POLICIES

This class uses the standard grading scale: A = 90.0+, B = 80.0 to 89.9, C = 70.0 to 79.9, D = 60.0 to 69.9, F = 60 or below.

Your final grade is a weighted average of the following:

- **Perusall.com Annotations (40%).** For each of the class readings, you will have the chance to “annotate” the text together with your classmates. More details on what is required of annotations (and how they are graded) are provided in a separate document.
- **Quizzes (10%).** Most weeks, there will be a D2L quiz covering the week’s reading, videos, and lecture notes. There is no time limit for these quizzes, but they will generally take no more than 1 hour if you are familiar with the week’s material. You’ll have three chances to do each quiz, and only your highest score will count.
- **Pseudoscience “Poster” (10%).** You will prepare a “poster” that describes and critiques a “pseudo-scientific theory”. More details will be provided in a separate document.
- **Final Exam (40% total).** The final exam will consist of three essays, each of which can be answered in 500 to 1000 words. You will have a week to complete the final.
- **Extra Credit (up to +2%).** There may be occasional opportunities for extra credit, which I will let you know about. For reasons of fairness, I can’t offer extra credit opportunities to individual students, so please don’t ask.

In general, assignments (including quizzes and Perusall reading annotations) will be due Sunday at 5:00 PM.

Plagiarism and Academic Integrity. Your work should be your own—please don’t use your classmates, friends, parents, internet sites, etc. to help you write your papers or answer test questions. And when you do use outside sources, make sure to give appropriate citation and acknowledgment for any words, ideas, or arguments. If the preponderance of the evidence suggests cheating has occurred (that is, if the evidence suggests that this is *more likely than not*), you will receive a failing grade on the assignment. A second violation will lead to failing grade for the course. Please also see the RCTC statement on academic integrity later in the syllabus.

Attendance. Students in face-to-face classes are expected to attend class regularly, while online students are expected to participate in the class discussions and activities. If you miss more than two weeks consecutively, or 1/3 of the total class sessions, you may receive a failing grade of FW. This may endanger your ability to receive financial aid. With this in mind, it is *your* responsibility to withdraw from the class if you decide not to continue. I am willing to make exceptions if circumstances require, but you need to let me know about these in a timely manner.

POLICY ON LATE WORK: PLEASE READ BEFORE EMAILING ME!

Please read the following *before* e-mailing me to request an extension on an assignment. If you have a quiz or activity due to a brief sickness, work conflict, class trip, computer malfunction, wedding, auto problem, court date, funeral, sporting event, etc., you do NOT need to email me (though it’s fine if you want to give me a heads up). Here are my policies for making up missed or late work:

- Over the course of the semester, you can make up to TWO missed Perusall annotations or quizzes by writing a 500 to 750-word response on the relevant material. This response should (1) clearly explain the main ideas in your own words, and (2) offer a thoughtful, considered response to it (the review questions on the handouts are a good place to start). **They should be submitted within ONE WEEK of the missing assignment.** Full or partial credit will be assigned based on how complete/accurate your response is. A special D2L assignment folder will be set up to submit these. When submitting this, please clearly indicate:
 - Which activity or quiz you missed, and what the initial due date was.
 - What resources (textbook, lecture notes, etc) you used to prepare this essay.
- For the poster assignment, your grade will be capped at 90% if it is submitted within 48 hours of the due date, and 80% if it is submitted within one week. Extensions past one week require my prior approval, and may result in additional penalties.
- The final exam cannot be submitted late.
- I will make exceptions to these policies if you can demonstrate a genuine need. Please come talk to me if anything comes up that is preventing you from succeeding in class.

ALL late work should be submitted to the D2L “Late Work” assignment folder. NO LATE WORK WILL BE ACCEPTED DURING THE LAST WEEK OF CLASS (again, absent exceptional circumstances).

RCTC COMMON POLICIES

This course will be taught in accordance with the following policies, which apply to ALL RCTC courses. If you have any questions about these, please let me know!

Academic Integrity Statement. The primary academic mission of Rochester Community and Technical College (RCTC) is the exploration and dissemination of knowledge, and academic honesty and integrity are integral to the academic process. Academic dishonesty - cheating, plagiarism, and collusion - is a serious offense which undermines the educational process and the learning experience for the entire college community. RCTC students are expected to understand and adhere to the concept of academic integrity and to the standards of conduct prescribed by the College’s Academic Integrity Policy. Any act of academic dishonesty attempted by a student at Rochester Community and Technical College is unacceptable and will not be tolerated.

Americans with Disability Act. Rochester Community and Technical College is committed to ensuring its programs, services and activities are accessible to individuals with disabilities, through its compliance with state and federal laws, and System Policy. Appropriate

accommodations are provided to those qualified students with disabilities. If you believe you qualify for an academic accommodation, please contact the Director of Disability Support Services, Travis Kromminga at 507-280-2968 or through the Minnesota relay TTY 1-800-627-3529. The office can also be reached via e-mail at DisabilityServices@rctc.edu

Military Friendly Statement. Rochester Community and Technical College (RCTC) is a military friendly campus, pledging to do all we can to help military veterans transition into college to complete their educational goals. RCTC is proud to be a Beyond the Yellow Ribbon campus, serving and honoring our veterans, military service members and their families. Through the Veterans Resource Center, RCTC offers student veterans an on-campus point of contact with other veterans, and program information to assist them in making a successful transition into college. For assistance, students are encouraged to contact the Veterans Assistant Coordinator, Mark Larsen, at 507-779-9375 or e-mail at mark.larsen@state.mn.us, or Glen Saponari, RCTC's VA certifying official at 507-280- 5511 or email at VeteranServices@rctc.edu.

Title IX Statement. Sexual violence and other forms of sexual misconduct is prohibited at Minnesota State colleges and universities (Minnesota State). Any individual who has been, or is being, subjected to conduct prohibited by the Sexual Violence Policy is encouraged to report the incident. Individuals may choose to file a complaint anonymously using the online reporting tool (<https://www.rctc.edu/services/student-affairs/sexual-violence/>). Individuals who choose to file anonymous reports are advised that it may be difficult for the college to follow up or take specific action, where information is limited. For additional information please see the RCTC Sexual Violence Policy, <http://www.rctc.edu/policies/system/sexualviolence> or contact Rebecca Peine, Title IX Coordinator, at 507-285-7195 or email at TitleIX@rctc.edu .

READING AND WRITING ABOUT PHILOSOPHY

Reading and writing about philosophy can highly rewarding (and even fun!), but it also can be difficult, even for people with lots of experience (even professional philosophers still find it difficult sometimes!). With this in mind, here are my expectations/suggestions with regard to the level of reading/writing in this class:

1. Philosophy as a discipline doesn't require any "special" academic background, and philosophers have come from almost every imaginable profession: stonemasons, mathematicians, teachers, physicians, etc. However, philosophy does require the ability to ask "uncomfortable" questions about one's own beliefs and actions, and to take seriously arguments and ideas that disagree with our own most deeply held beliefs.
2. Before starting this class, you should be confident in your ability to read and understand a college-level textbook. This does NOT mean I expect you to grasp every concept/idea right away (I know that some of this stuff is pretty tricky, and that's why I am here to help!). However, I do expect that you will read the textbook BEFORE you come to class (or post to the discussion board, etc.), and come away with a basic understanding of main ideas. If you're unsure about your ability to do this, get in touch with me *early* in the class so we can discuss this.
3. On average, students should expect to spend about five minutes per standard textbook page of philosophical reading, which includes the following:
 - a) "Pre-reading" the chapter or article to get a sense of the structure, headings, key terms, etc.
 - b) Reading the chapter carefully, stopping to take notes at least every page or so. At the minimum, your notes should include major topics addressed, definitions of key terms, important arguments or objections to arguments, and notable examples.
 - c) Taking time to review the material AFTER you have finished reading a section. Basically: spend 5-10 minutes trying to review what you have learned WITHOUT looking at the text or your notes. This can help you get a better sense of what you've grasped well, and what you still need to work on. Research has also found that this is a key step in actually being able to remember/use the information in the future.
 - d) As a general rule, techniques like highlighting or rereading are NOT very effective unless they are carefully limited. So, you don't want to be highlighting every other sentence, or trying to re-read a whole chapter. Try to limit your highlighting to just key points, and keep your rereading constrained to parts that genuinely confuse you.
 - e) I would recommend taking a brief "reading break" every 20 to 30 minutes.
4. As part of the class, you will be expected to write extended, argumentative essays. While you will be learning a bit more about how to write these, you should already be aware of basic principles of composition such as the use of **thesis statements**, how to organize your essays into **paragraphs**, and the importance of **citing** your sources using standard forms such as MLA, APA, Chicago, etc. If it has been a while since you have done this, don't worry! There are a number of excellent resources that you can review online. I particularly recommend the Purdue Online Writing Lab (https://owl.purdue.edu/owl/purdue_owl.html). I'd also encourage you to look at the "Guide to Writing Philosophy Papers", prepared by RCTC Philosophy Faculty (<https://philpapers.org/go.pl?id=SHEHTW&u=https%3A%2F%2Fphilpapers.org%2Farchive%2FSHEHTW.pdf>)
5. All told, you should be prepared to spend around 100 to 150 hours total on this three-credit class (or 6 to 9 hours per week for a 16-week semester). Very roughly (and this will vary by student), this might break down as something like the following: (a) 30-40 hours on reading, note-taking, and completing quizzes, (b) 15-20 hours working on the exams, and (c) 30-40 hours attending class (or, for online students, reading lecture notes and writing discuss board posts).

GETTING IN TOUCH WITH ME (AND WHAT TO INCLUDE IN AN EMAIL)

The best way to get ahold of me is by e-mail, which I will aim to respond to within ONE working day (for simple questions) or TWO working days (for more complex ones). I don't generally check email on the weekends or holidays. If you don't hear from me by then,

please try emailing me again. In order to help me provide you with quick, effective feedback, here's a general template for what I expect in an email.

Dear Brendan (or Professor Shea):

My name is [full name], and I'm a student in [this section] of [this class]. I had a question regarding [identify quiz, textbook chapter, etc. Be specific, and include a copy of anything I might need to answer your question, including the full problem text, if applicable]. Here's everything I've tried so far to figure out the answer for myself [looked at the syllabus, notes, textbook, etc.], and here's my best guess as to the answer. Could you help me by doing the following? [Be specific in what you are asking me to do.] [Feel free to include anything else you'd like here. I'm always happy when students send along ideas/links/whatever vaguely relating to ethics and philosophy 😊]]

As I rule, I will not respond to requests that you be exempted from class policies without very good reason (e.g., for late-work extensions outside the conditions outlined above), or to emails that lack basic identifying information (your full name, class, etc.). For long or complex questions, I highly encourage you to schedule an appointment so that we can talk (either in person or by phone). Oh, and please don't call me Mr. Shea (That's my dad!).

RESOURCES FOR STUDENT SUCCESS

Some helpful resources at RCTC (all of which are included with your course tuition) include the following:

- **Student Support Services/TRIO (SS 159)** provides academic support for first-generation and low-income college students, as well as those with documented disabilities.
- **Drop-in Tutoring (AT 306)** is available free of charge to *all* RCTC students. Please take advantage of it!
- **Online Tutoring** is available at www.tutor.com, accessible via D2L (so, don't go directly to the website—instead, log on to the main RCTC D2L page, and look for the link). This online tutoring option also includes a form where you can submit a paper for review (there is something like a 12-hour turn around).

COURSE CALENDAR

The course calendar is below. I will let you know (via D2L) if there are any changes to this calendar. IHPS = Introduction to History and Philosophy of Science. In general, assignments (such as quizzes and Perusall reading annotations) will be due on SUNDAY at 5:00 PM.

Wk	Starting (Sun)	Lecture Topic	Readings	Other Assignments
1		Introduction	Syllabus, IHPS ch. 1 (Introduction)	Quiz 1
2		Scientific Knowledge and its Limits	IHPS ch. 2	Quiz 2
3		Scientific Method	IHPS ch. 3	Quiz 3
4		Scientific Change	IHPS ch. 4	Quiz 4
5		Science and Non-Science	IHPS ch. 5	Quiz 5
6		History of Science	IHPS ch. 6, 7, or 8	No quiz. Pseudo-science poster due.
7		Contemporary Worldview	IHPS ch. 10	Quiz 6
8		Final Exam		Final Exam