**PHIL 125. PHILOSOPHY OF SCIENCE**

**Spring 2024**

**Instructor:**  Manuel Barrantes ([barrantes@csus.edu](mailto:barrantes@csus.edu); 540.246.8822)

**Class meetings:** Mondays, Wednesdays & Fridays 10:00-10:50am

**In-Person Office Hours:** Thursdays 11am-1pm (Mendocino Hall 3022)

**Online Office Hours:** Mondays & Fridays 1:15-1:45pm; Thursdays 11am-1pm; and by appointment.

(<https://csus.zoom.us/j/5268471798>)

**Credit hours:**  3WTU

**I. Course Description**

CATALOG DESCRIPTION: Study of the philosophical problems that arise in the sciences: the nature of scientific reasoning, the limits and styles of explanation, identifying pseudoscience, values in science, unity and diversity of the sciences, and science's impact on our world view.

The course is divided in three units, each of which addresses one conceptual aspect of the philosophy of science: Unit one, ‘Science, Pseudoscience & Science Skepticism’, focuses on the problem of differentiating science from pseudoscience, and the reasons to trust science. Unit two, ‘Scientific Inference’, is a historical and analytical study of the different patterns of inference used in scientific inquiry. Unit three, ‘Scientific Realism’, focuses on whether one should believe in the existence of the unobservable entities and processes posited by our best scientific theories. You do not need to have scientific or philosophical background to succeed in this course, but you are expected to be willing to understand and use scientific examples and philosophical arguments. All readings will be posted on canvas.

**II. Methodology**

This is an in-person class. The content is divided in three units. Every week you will have to read one or two articles, and my class notes. Every class you will take a short in-class quiz. You must bring your own electronic device to take the quiz (phone, laptop or tablet; laptops can be checked out at the University Library). You will not be able to take the quiz if you don’t come to class. During the semester, you will have to do a 4-minute presentation on one topic, take four in-class tests, and an in-class final exam. The final exam will have the format of a guided paper. There will be a few exercises interspersed in every lecture, some of which may include group work. Office hours will be held during the times outlined above. You do not need an appointment to come to regular office hours, but you may have to wait if I am with another student. If you cannot make it to office hours, contact me and we will set up an appointment. Communication will be via canvas announcements and canvas email.

**III. Learning OUTCOMES**

*1. Philosophy:*

* You will learn the concepts necessary to understand some of the most important debates in current philosophy of science.
* You will learn to write philosophy papers.
* You will learn to evaluate philosophical arguments.

#### 2. General education: This course satisfies GE area B-5 (upper level scientific and mathematical literacy). The specific learning objectives of Area B-5 covered in this class are:

* Cite critical observations, underlying assumptions and limitations to explain and apply important ideas and models in one or more of the following: physical science, life science, mathematics, or computer science.
* Recognize evidence-based conclusions and form reasoned opinions about science-related matters of personal, public and ethical concern.

**IV. Course Requirements**

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| **%** | **Assignments** | **Description** |
| 20% | 39 quizzes | Every lecture you will take a quiz with 5 multiple-choice questions, 2 of which will be on the previous lecture, and the other 3 on the week’s readings (you must read the article(s) before the beginning of the week, and the lecture notes before each lecture). Quizzes will be held at the beginning of each lecture, starting on week 2. You will not be able to take the quiz if you don’t come to class. You must bring you own laptop or cell phone to take the quizzes. Absolutely no make ups. The lowest 9 quizzes will be dropped. |
| 60% | 3 tests | The last Friday of each unit you will take an in-class test. More details, including a question poll, will be posted on Canvas. Make ups should be requested in person after class at your earliest convenience, **not by email**, and will receive a 1/3 letter-grade penalty, unless you have a documented justification. |
| 20% | Final Exam (Paper) | The in-class final exam will have the format of a guided paper (i.e., several questions whose answers correspond to one part of a paper). Three weeks before the final, you will be provided a list of topics to choose from. We will devote some class time to help you prepare for this exam. More details will be posted on canvas. If you take a picture of your exam, type it exactly as is, and upload the document to canvas the same, you will get a 1/3 letter-grade extra credit on this assignment. |

**V. COURSE GRADING SCALE (%)**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| A | [94 -100] | B+ | [87 - 90[ | B- | [80 - 84[ | C | [74 - 77[ | D+ | [67 - 70[ | D- | [61 - 64[ |
| A- | [90 - 94[ | B | [84 - 87[ | C+ | [77 - 80[ | C- | [70 - 74[ | D | [64 - 67[ | F | [0 - 61[ |

**VI. SCHEDULE**

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| --- | --- | --- | --- |
| **Week** | **Topic** | **Readings\*** | **Assignments\*\*** |
| **UNIT 1. Science, Pseudoscience & Science Skepticism** | | | | |
| Week 1  1.22-1.26 | Introduction | -- | --- |
| Week 2  1.29-2.2 | Popper’s falsifiability criterion  Laudan on Demarcation | Karl Popper, Science as falsification Larry Laudan, Science at the bar | Quizzes 1-3 |
| Week 3  2.5-2.7 | More problems with falsifiability  The Duhem-Quine thesis | Peter Godfrey-Smith, Popper, Conjecture and Refutation | Quizzes 4-6 |
| Week 4  2.12-2.16 | Kuhn on Demarcation  Lakatos on Demarcation | Deborah Mayo, Ducks, Rabbits etc. | Quizzes 7-9 |
| Week 5  2.19-2.23 | Thagard on Demarcation  Ladyman on Demarcation | Paul Thagard, Why astrology is a pseudoscience | Quizzes 10-11  Test 1 |
| **UNIT 2. Scientific Inference** | | | | |
| Week 6  2.26-3.1 | Deductive & Inductive arguments  Demonstrative reasoning | Siu-Fan Lee, What is Logic?  Ernan McMullin, Demonstration | Quizzes 12-14 |
| Week 7  3.4-3.8 | Inductive reasoning  Hume’s problem of induction | David Hume, Enquiry IV, II  Ernan McMullin, Induction | Quizzes 15-17 |
| Week 8  3.11-3.15 | Cartwright on laws of nature  Popper on scientific inference | Nancy Cartwright, Do the laws of physics state the facts? | Quizzes 18-20 |
| Week 9  3.25-3.29 | Retroductive reasoning  Descartes on retroduction | René Descartes, Principles IV, 201-207  Ernan McMullin, Retroduction | Quizzes 21-23 |
| Week 10  4.3-4.5 | Descartes on realism  Contemporary debate | Bas van Fraassen, Response to McMullin | Quizzes 24-25  Test 2 |
| **UNIT 3. Scientific Realism** | | | | |
| Week 11  4.8-4.12 | Logical positivism  Overlap argument | Grover Maxwell, The ontological status of theoretical entities | Quizzes 26-28 |
| Week 12  4.15-4.19 | Constructive empiricism Underdetermination | Bas Van Fraassen, Arguments concerning scientific realism | Quizzes 29-31 |
| Week 13  4.22-4.26 | No miracles argument  Pessimistic metainduction | Larry Laudan, A confutation of convergent realism | Quizzes 32-34 |
| Week 14  4.29-5.3 | Entity realism  Structural realism | Ian Hacking, Entity realism | Quizzes 35-37 |
| Week 15  5.6-5.10 | Global vs Local arguments  Antirealism vs Science skepticism | Leah Henderson, Global vs Local Arguments for scientific realism | Quizzes 38-39  Test 3 |
| Finals Week | **Final Exam: 5/14 (Tuesday) from 8am to 10am** | | | |

\* In addition, you must read my class notes.

\*\* Quizzes are taken at the beginning of each class. Tests are taken the last Friday of the week specified in the syllabus.

**VIII. course Policies and STUDENT RESOURCES**

* All work done in this course is subject to the CSUS academic honesty policy, which you may read at: [Academic Honesty Policy & Procedures.](https://sacramentostate.policystat.com/policy/11300038/latest) You can also check the [Library’s guide on Plagiarism](https://csus.libguides.com/plagiarism) and *my note on Canvas*.
* If you are experiencing serious distress, you can contact either [Student Health and Counseling Services](https://www.csus.edu/shcs/) or [Peer and Academic Resource Center](https://www.csus.edu/parc/).
* You can check out a laptop at the [CSUS University Library](https://www.csus.edu/information-resources-technology/teaching-learning/laptop-checkout.html).
* If you are experiencing any COVID- like symptoms (fever, cough, sore throat, muscle aches, loss of smell or taste, nausea, diarrhea, or headache) or have had exposure to someone who has tested positive for COVID, contact [Student Health & Counseling Services (SHCS)](https://www.csus.edu/student-life/health-counseling/) and notify me. More information can be found [here](https://www.csus.edu/return-to-campus/).
* If you believe that you require disability-related academic adjustments (including pregnancy-related disabilities), please contact [Services for Students with Disabilities (SSWD](https://www.csus.edu/student-affairs/centers-programs/services-students-disabilities/)) to discuss eligibility. A current accommodation letter from SSWD is required before any modifications. These adjustments are not retroactive.
* Sac State is committed to supporting students and fostering a campus environment free of sexual misconduct and gender-based discrimination. If a student chooses to disclose to a faculty or staff member an experience related to sexual misconduct which includes, but is not limited to rape, relationship violence, or stalking, all faculty and staff members are obligated to report this disclosure to the university’s Title IX Coordinator. Contact Sac State’s Title IX Coordinator, Skip Bishop, at 916.278.5770 or email at william.bishop@csus.edu. Upon receipt of the report, the Title IX Coordinator will contact you to inform you of your rights and options as a survivor and connect you with support resources, including resolution options for holding accountable the person who harmed you. Students who elect not to discuss their experience with the Title IX Coordinator can speak confidentially to the following confidential resources: Student Health & Counseling Services at The WELL 916.278.6461; [www.csus.edu/shcs](http://www.csus.edu/shcs). Campus Confidential Advocate – Laura Swartzen ([weave@csus.edu](mailto:weave@csus.edu)). On Campus Phone Number: 916.278.5850 (during business hours) WEAVE 24/7 Hotline: 916.920.2952.