Course Syllabus - Philosophy of Science across the Sciences

Instructor: T.Y. Branch, contact@tybranch.com
Teaching Assistant: TBD
Time and Location: TBD
Prerequisites: N/A

Course Description

This graduate seminar offers an in-depth exploration of classic themes in the philosophy of science through the lens of different sciences. Each week, students will be introduced to contemporary questions drawn from different disciplines (e.g. Astronomy, Epidemiology, Ecology, Agricultural science) and critically examine how current scientific research intersects with enduring philosophical concepts such as underdetermination, observation, reductionism, scientific explanation and the role of values in science. Through an emphasis on close reading, reflective discussion and applied analysis, by the end of the course, students will be able to competently recognize important philosophical concepts in science, formulate clear philosophical critiques of real-world practices and produce original analyses.

Learning Outcomes

- Understand classic concepts in the philosophy of science
- Identify important questions in contemporary science
- Recognize classic concepts in contemporary scientific practice
- Reflect critically on the implications of these concepts for the sciences

Required Texts and Materials

This course has no required textbook. Readings will be made available online.

Course Policies

This course will use the standard online learning platform of the university for the purpose of announcements, accessing course materials, submitting assignments and discussion board posts. Instructors and the TA will only use official university email accounts to communicate with students. Group messages and announcements will be posted online as well as mentioned in class. It is the students' responsibility to ensure that the proper email notification system is set up to receive notifications. Students wishing to contact the instructors and the TA individually can do so via email at the addresses shown on the syllabus.

Schedule

Students are assigned a weekly reading for which they are expected to come to class prepared to discuss. These readings serve as the basis for the assignments and final paper.

Week	Topics	Reading(s)
1	**Methodological Pluralism** Anthropology	Ruphy, Stéphanie. (2011). "From Hacking's Plurality of Styles of Scientific Reasoning to 'Foliated' Pluralism: A Philosophically Robust Form of Ontologico-Methodological Pluralism," *Philosophy of Science*, 78(5): 1212–1222.
2	**Epistemic Authority** Artificial Intelligence	Bender et al. "On the Dangers of Stochastic Parrots: Can language models be too big?" *Proceedings of the 2021 ACM conference on fairness, accountability, and transparency*, pp. 610-623.
3	**Underdetermination** Climate Science	Oreskes, N. & Conway, E. (2010) *Merchants of Doubt* (selection).
4	**Models and Idealization** Astronomy	Jebeile, J., & Kennedy, A. G. (2015). "Explaining with Models: The Role of Idealizations." *International Studies in the Philosophy of Science*, 29(4), 383–392.
5	**Theory-Unification** Physics	Carroll, S. M. (2022). "The quantum field theory on which the everyday world supervenes." In *Levels of Reality in Science and Philosophy: Re-Examining the Multi-Level Structure of Reality* pp. 27-46.
6	**Explanation** Biomedical Science	Keller, E. F. (1995). *Reflections on Gender and Science*. Yale University Press. (selection).
7	**Inference** Epidemiology	Greenland, S., Senn, S. J., Rothman, K. J., Carlin, J. B., Poole, C., Goodman, S. N., & Altman, D. G. (2016). "Statistical tests, P values, confidence intervals, and power: a guide to misinterpretations." *European Journal of Epidemiology*, 31(4), 337-350.
8	**Epistemic Authority** Ecology	Harding, S. G. (1994). "Is science multicultural?: Challenges, resources, opportunities, uncertainties." *Configurations* 2(2), 301-330.
9	**Demarcation** Evolution	Popper, K. R. (1959). "The Problem of Demarcation." in The *Logic of Scientific Discovery*. London: Routledge.
10	**Values** Botany	Wilholt, T. (2013). "Epistemic Trust in Science." *The British journal for the philosophy of science*, 64(2), 233-253.
11	**Epistemic Reliability** Psychology	Nosek, B. A., Hardwicke, T. E., Moshontz, H., Allard, A., Corker, K. S., Dreber, A., ... & Vazire, S. (2022). "Replicability, robustness, and reproducibility in psychological science." *Annual review of psychology*, 73(1), 719-748.
12	**Transparency** Agricultural Science	Gundersen, T. & Holst, C. (2022) "Science Advice in an Environment of Trust: Trusted, but Not Trustworthy?" *Social Epistemology* , 36:5, 629-640.

Assignments

The course will be evaluated as follows:

- *Assignment 1: Open Questions in Science.* Students will search for an unanswered question in science and write 500 words outlining descriptive and normative features of the question. They will upload their account to the 'Assignment 1: Questions in Science' folder *and* share a shortened version of the assignment (100 words) on the discussion board under 'Assignment 1: Open Questions in Science.'

- *Assignment 2: Select and Connect.* Students will select one example from the discussion board (it does not need to be their own) and connect it in 3-5 sentences to a concept in the readings thus far. Students will then post their example and connection to the class discussion board.

- *Assignment 3: Essay Outline.* Students will write an argumentative outline of their final essay (approx. 1 page) to share anonymously for peer review. The outline should be uploaded (without any identifiers, name, student number etc.) to the 'Assignment 3: Essay Outline' folder. For more on how to write an outline, see the 'How to Write an Essay Outline' section below.[1]

- *Assignment 4: Practicing Peer Review.* Students will practice their editing skills by anonymously reviewing the outline of one of their peers. The review (350 words) should comprise of what they take the author's argument to be *and* constructive criticism for how the outline and subsequent essay could be improved. The review should be uploaded to the 'Assignment 4: Practicing Peer Review' folder. Authors will receive the results of their peer review shortly afterwards to incorporate the suggestions into their final essays before submission. For more on how to conduct peer review, and a rubric, see the 'How to Evaluate an Essay Outline' section below.

- *Final Essay:* Students will write a final essay (4000 words) based on their essay outline and feedback from the peer review. For more on how to write a philosophy essay, see 'How to Write a Philosophy Essay' below with sample rubric.

[1] From Carolina Flores' quick guide.

How to Write an Essay Outline

An outline is the skeleton of your paper containing the thesis, supporting arguments, objections, and replies to show how the paper will be structured. Outlining saves time by helping to write a more robust paper in fewer drafts. By forcing an author to identify central points, clarify what they want to say from the outset, identify gaps in an argument and reserve space to answer each part of a prompt (the point to address), it helps to ensure that the paper remains focused on the main line of argument. Once an outline is complete, all that is then required for the essay is filling in the details.

Steps to producing an Essay Outline

1. Understand the prompt (consult readings and notes).
2. Brainstorm about the prompt.
3. Choose a clear position to defend in reference to the prompt; you need not be certain of it—clarity matters more than confidence.
4. Identify weaknesses in your position and likely objections.
5. Select and flesh out the strongest argument for your position (consider diagramming).
6. Pick and sketch responses to objections.
7. Assemble these elements into the following template.

Standard Philosophy Essay Outline Format

1. **Introduction**
    - State the question or prompt.
    - Briefly note why the question matters (optional).
    - State thesis (i.e. the position the paper will defend).
    - Provide a short roadmap summarizing the argument.
2. **Main argument**
    - Present each reason for the thesis as a separate bullet.
    - Defend any non-obvious premises.
    - Note: Define important technical terms when first used.
3. **Objections and replies**
    - State a significant objection (authors' or an attributed one).
    - Offer response(s).
    - Note: For classroom assignments and papers, one well-developed objection and reply is often sufficient.
4. **Conclusion**
    - Restate your position.
    - Briefly summarize the argumentative route taken.

How to Evaluate an Essay Outline (Rubric)

For guidance on how to evaluate an essay outline, see rubric below.

Scoring (out of 30 points):
- 0 = Not present / fail
- 1 = Partial / inadequate
- 2 = Meets expectation
- 3 = Exceeds expectation

Criterion	Description	Score (0–3)
1. Question/prompt stated	Introduction lists the driving question or prompt.	___
2. Thesis present and clear	Outline contains an explicit thesis stating the author's position.	___
3. Argument summary	Introduction includes a brief roadmap of the argument.	___
4. Main argument	Main argument lists distinct reasons/premises.	___
5. Premises	Explained and non-obvious premises have brief justificatory notes/defenses.	___
6. Structure	Provides justification for which points support which conclusions.	___
7. Objection(s) included	At least one substantial objection to the thesis is stated.	___
8. Reply included	A coherent response to the objection is given.	___
9. Conclusion	Restates thesis and summarizes argumentative route.	___
10. Overall	Is the outline compelling and clearly written.	___

Total Score = ___

5–30 = Excellent (fully follows instructions)
18–24 = Good (minor omissions)
10–17 = Weak (multiple gaps)
0–9 = Incomplete (major omissions)

For criteria with a score between 0 and 1, suggest specific solutions (e.g., "add definitions for X," "move premise Y so it is indented under reason Z").

How to Write a Philosophy Essay

With an outline already complete, writing the actual essay should be just a matter of filling in the details. The material covered in class should be sufficient to write the essay, but additional material can be sourced as needed—just be certain to cite appropriately.

For additional tips for effective philosophical writing see:

- Connie Rosati, "Some suggestions on how to approach reading a philosophy article or book"
- Jim Pryor's Writing Guidelines: `http://www.jimpryor.net/teaching/guidelines/writing.html`
- Yablo's Writing Methods: `http://www.mit.edu/~yablo/writing.html`
- Harvard Philosophy Department Guide: `https://philosophy.fas.harvard.edu/files/phildept/files/brief_guide_to_writing_philosophy_paper.pdf`

Evaluation for Philosophy Essay

Criterion	**Description**	**Score (0–3)**
1. Thesis Clarity	The essay presents a clear and concise thesis statement that establishes the main argument.	___
2. Argument Structure	Each argument is well-structured and logically coherent, with distinct premises supporting the conclusion.	___
3. Use of Evidence	Strong use of textual evidence and examples effectively supports claims and illustrates key points.	___
4. Engages Counterarguments	The paper identifies and thoughtfully addresses objections or counterarguments to the thesis.	___
5. Clarity and Style	Writing is clear and accessible, with appropriate vocabulary and well-organized paragraphs.	___
6. Technical Accuracy	Accurate interpretation of philosophical concepts and proper use of technical terms are evident.	___
7. Critical Evaluation	The paper demonstrates original thought through critical engagement and evaluation of arguments.	___
8. Conclusion	The conclusion effectively summarizes the paper's main points and reinforces the thesis.	___
9. Citations and References	Proper citation of sources and adherence to the recommended formatting style throughout the paper.	___
10. Overall Impression	The paper offers a compelling exploration of the philosophical topic that reflects deep understanding and insight.	___

Total Score = ___