Description of Subject Matter & Methods of Instruction

What divides science from pseudo-science? What is it to “explain” phenomena — how do the sciences accomplish this? Is there a distinctive “scientific method” by which science provide us with knowledge of the general features of nature? What propels scientific revolutions? Can we make sense of progress in science? How should democratic societies go about ordering their research priorities? These are the sorts of questions philosophers ask about science. By exploring them in this course, we’ll work to develop a deep and general understanding of the particular human pursuit we call ‘science’.

Course meetings will involve a blend of lecture and discussion; but since philosophy is best learned by doing philosophy, discussion will be our primary mode of interaction in the course. (We’ll also “simulate” doing some science via a little group exercise — to be explained.) Your course grade will be based on your contribution to the discussion, your performance on regular short writing assignments and longer essays, and a group project. The prerequisites for the course is PHIL 100; however this prerequisite may be waived for students (especially from the sciences) willing to work a certain level of abstraction.

Learning Goals

In successfully completing this course, you should:

- Gain a deep understanding of the debates about scientific methodology;
- Gain a deep understanding of key epistemological issues in science (e.g., the justifiability of induction, the nature of evidence, and the role of theory in observation);
- Gain a sophisticated understanding of science as a social phenomenon and institution;
- Become familiar with important metaphysical debates in the philosophy of science (e.g., concerning realism and natural kinds);
- Continue to develop your critical/analytical thinking, reading, and writing skills.

Instructional Materials and Sources

Steven French, Science: Key Concepts in Philosophy (Continuum); Paul Feyerabend, Against Method, 4th Ed. (Verso); and supplementary readings distributed in PDF from the course blog.

Methods of Evaluation

Your final grade will be based on four components as described below. Please note that about half of your grade will be determined by your regular, everyday effort. It will thus be quite important to stay current. Note as well what the different letter grades represent. According to the Course Catalog (http://www.bucknell.edu/catalog.xml), an ‘A’ means ‘Superior achievement’, a ‘B’ means ‘High pass’, a ‘C’ means ‘Pass’, a ‘D’ means ‘Low pass’, and an ‘F’, of course, stands for ‘Failing work’. Unless you’re some kind of savant, it’s highly unlikely that you can produce superior work (or even B-level, good, but uninspired work) without putting time and effort into your studies.

Participation & Preparation (20%). Since much of our time in class will be spent discussing rather difficult problems and concepts, it will be crucial that you come prepared. What does “coming prepared” mean? It means not only passing your eyes over the reading assigned for that day, but making a serious attempt to critically engage with it and coming to class ready to share the fruits of your labors (questions, reactions, remaining confusions, &c.). The short response papers (see below) are designed to help stimulate this preparation. During class, I expect you to be a willing participant. Break the ice. Ask questions. Respond to your peers. Offer your considered opinions. In short: be ready to do some philosophy!

The Box Project (15%). In small groups, you will compete to unravel a puzzle that has perplexed and enthralled dozens of students before you: “What’s in that cardboard box?” In so doing, you will reflect on our study of scientific methodology. Your grade will be based on these reflections (some written, some presented), not your ultimate success in divining the secrets of the box. Further details will be announced in class.

Weekly, Short Writing Assignments (25%). Each week, I will post on the course blog a series of questions for reflection connected to our reading and discussion so far. You will be invited to respond to a selection of these questions
either on the blog or via email to me. Grades will be assigned on a simple 0-3 basis (0= “missing/insufficient”, 1= “decent/acceptable”, 2= “good”, 3= “excellent!”). In calculating your total grade for this portion, I will drop your worst (or missing) three papers.

**Longer Essays (40%).** I will assign three longer essays at roughly the thirds of the term. The first two (approximately 1,200–1,500 words each) may be revised in light of my feedback for a new grade. Only the best of the two will be counted toward your final grade. A final research essay (approximately 2,500–5,000 words) will be due on the last day of classes (December 6th).

**Other Course Policies & Information**

**Office Hours.** You are invited and encouraged to supplement your in-class learning by visiting me in my allotted office hours or at some other time that suits us both. You do not need to have any specific mission to accomplish. Feel free to drop by.

**Electronic Distractions.** You may use a cell phone or computer in class up to four times; each time, your course grade will go down one letter grade. If you use it, I strongly suggest you remove the temptation for making this trade-off by turning off your various gadgets before our class meetings. Class time is special time. If you have any questions about this policy, please let me know.

**Policy on Late Work.** Late submissions of the short writing assignments will not be accepted (unless you have an extended illness or condition that warrants a letter from the Dean). Other late work will be docked by 5% per day late.

**Sources and Academic Honesty.** Unless otherwise instructed, you must include a Works Consulted/Cited page even if your only source was the primary source upon which your essay focuses. Cite correctly all materials used including primary sources, textbooks, materials from the internet, and lectures. I will not hesitate to refer students who plagiarize or commit any other form of academic dishonesty to the University Board of Review (http://www.bucknell.edu/x1337.xml).

**Accommodations for the Disabled.** If you have a disability that may affect your performance in this course, please talk to me (either by email or in person) at your earliest convenience and I will make every effort to accommodate your needs. If you have not yet spoken with the appropriate Associate Dean about your disability (http://www.bucknell.edu/x7759.xml), please do so as soon as possible. Accommodations will need to be sanctioned by their office.

**Topic Schedule**

The following schedule of topics is subject to change as our progress and interest dictates. Please stay current with the course blog for the updated reading/assignment information. In mid-November, we will collectively decide on what topics to focus on in our last few meetings.

**Weeks 1–2 (August 25th–September 1st)**
- Historical, Sociological, and Philosophical Perspectives on Science
- The Role of Creativity
- Modeling the Scientific Method

**Week 3 (September 6th–8th)**
- Heuristics and Analogies
- Project Work Day (9/8)

**Week 4 (September 13th–15th)**
- The Verification Model of Confirmation
- The Paradoxes of Confirmation (Ravens, Quine-Duhem)

**Week 5 (September 20th–22nd)**
- The Inductivist Model of Confirmation
- Inductive Skepticism (Humà’s Problem, Goodman’s Problem)

**Week 6 (September 27th–29th)**
- The Evolutionary Model of Science
- Can we draw a line between Science and Non-Science?
- Case Study: the Puzzle of the Missing Solar Neutrinos
- 1st Essay Due (9/29)

**Week 7 (October 4th–6th)**
- Case Study: Creationism and Intelligent Design in the Courtroom
- Box Project Report (10/6)

**Weeks 8–9 (October 13th–20th)**
- The Role of Observation and Experimentation
- Scientific Explanation
- The Nature of Evidence, Inference to the Best Explanation

**Weeks 10–11 (October 25th–November 3rd)**
- Scientific Progress and Revolutions
- Rationality and Non-Rational Persuasion
- Case Study: Galileo and the Telescope

**Week 12 (November 8th–10th)**
- Science and Politics
- Case Study: The “Star Wars” Defense Project & Nuclear Winter
- 2nd Essay Due (11/8)

**Weeks 13–14 (November 15th–22nd)**
- The Realism/Anti-Realism Debate
- Final Box Project Presentations (11/17)

**Thanksgiving Break**

**Weeks 15–16 (November 29th–December 6th)**
**Topics to be Decided by the Class. Here are some options:**
- Expanding on any of the above topics,
- Gender bias in science,
- Ethics/politics of science: How should democracies decide how to spend research dollars? What research projects are off-limits?
- What are laws of nature?
- I’m happy to consider others . . .