

# Course Syllabus

## Course Information

**Phil 4380** Philosophy of Science

**Fall 2009** M/W 4:00pm–5:15pm

## Professor Contact Information

**Professor** Matthew J. Brown

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**Office Phone** 972–883–2536

**Office Location** JO 5.708

**Office Hours** Monday/Wednesday 1–2pm and by appointment.

## Course Pre-requisites, Co-requisites, and/or Other Restrictions

This course is an upper-level course in the humanities, and presupposes the basic skills of reading, analyzing, and writing at an academic level. No particular knowledge of philosophy or the sciences is presupposed, but students unused to reading and writing about difficult, sometimes fairly technical material are urged to consult with the professor early and often.

## Course Description

Science plays an enormously influential role in our society. As a social institution, it commands enormous respect and social influence, as well as vast sums of funding. It produces results that are greatly sought after, for both good and ill. At the same time, science generates great controversy when it collides with various religious, economic, and educational agendas. The adjective “scientific” garners almost immediate respectability to whatever it is applied, and, in some circles, it is a prerequisite for being taken seriously. Yet to many it also bespeaks

alienation, abstraction, and a void of meaning, useless in our attempt to understand values. Some even deride science as mere ideology and power-mongering, as sexist, racist, or elitist.

Science is open to interpretation and critique; as a result, it stands in need of explanation, elaboration, justification, limitation, or change. Philosophy of science attempts to understand how and why science works, to explain its successes and occasionally uncover its failures, to interpret its results, and to discover, what, if any, are its limits. Philosophers of science also try to situate science in the broader scheme of human activities and social institutions, and to understand the way in which our particular cognitive, social, political, and moral situation impacts its development.

Some issues in philosophy of science are common to all the sciences: questions about theories and theory-change, observation experimentation, explanation, confirmation, and realism. Philosophers of science also look at issues within particular sciences, such as the interpretation of quantum mechanics, the status of evolutionary theory, or problems of observation in psychology. In this course, our primary focus will be on general problems in philosophy of science, including some of the following:

- What counts as “science”? Can we distinguish between science and pseudo-science or non-science?
- Does science represent a unified hierarchy of knowledge (and should it?)
- What were the philosophical and political motivations for the “Unity of Science” movement in the early 20th century?
- How are scientific theories confirmed, rejected, or replaced?
- What is the nature of scientific evidence?
- Does our evidence only support one theory?
- Is science objective? Rational? True?
- What is the role of values in scientific change?
- How do gender, race, and politics affect science?
- Does science uncover the nature of reality? Or is it merely a useful tool for prediction?

## **Student Learning Objectives/Outcomes**

Students will analyze and interpret a significant body of primary works in philosophy of science.

Students will develop their ability to read, analyze, and write about complex texts.

Students will demonstrate knowledge of the major questions and traditions in the philosophy of science.

Students will be able to critically analyze and discuss the nature of, value of, and challenges to science as an intellectual and cultural institution.

## Required Textbooks and Materials

- Thomas Kuhn, *The Structure of Scientific Revolutions*
- Peter Godfrey-Smith, *Theory and Reality* [PGS]

All other required readings are available on the UTD McDermott Library Electronic reserves at <http://utdallas.docutec.com/eres/> .

## Suggested Course Materials

There are a variety of good readers and secondary sources introductory to the philosophy of science. For primary sources, I recommend the Curd and Cover collection and the Kourany collection. Alan Chalmers has an excellent textbook, *What Is This Thing Called Science?* More basic analyses of science can be found in Stephen Carey's *A Beginner's Guide to Scientific Method* and Goldstein's *How We Know*.

For a fascinating intellectual-social history of the discipline of philosophy of science, you should look at George Reisch, *How the Cold War Transformed Philosophy of Science*.

## Assignments & Academic Calendar

While all of the readings are important to the topics, students should focus on the readings in **bold**.

Day	Topic	Readings
M 8/24	Intro	Carey, <i>A Beginner's Guide to Scientific Method</i> , Chapter 1; <b>Peter Godfrey-Smith, <i>Theory and Reality</i>, Chapter 1 [PGS 1]</b> ; Churchman, "What Is Philosophy of Science?"
W 8/26	Science v. Pseudoscience	<b>Feynman, <i>Cargo Cult Science</i>; PGS 4</b> ; Hansson, "Science and Pseudo-Science"
M 8/31		<b>Karl Popper, <i>Science: Conjectures and Refutations</i>; Lakatos, <i>Science and Pseudoscience</i>; Feyerabend, <i>How to defend society against science</i></b>

Day	Topic	Readings
W 9/2	The Scientific Status of Creation-Science	McLean v. Arkansas Board of Education (IV.C); <b>Ruse, Creation Science is Not a Science; Laudan, Commentary: Science at the Bar</b> ; Ruse, Response
M 9/7	Labor Day Holiday	<b>None</b>
W 9/9	Unity of Science?	<b>Oppenheim and Putnam; PGS 2</b> ; Carnap, Logical Foundations of the Unity of Science
M 9/14		<b>Lloyd, Feyerabend, Mill, and Pluralism; Dupre, Metaphysical Disorder and Scientific Disunity</b> ; Capps, Achieving Pluralism
W 9/16	The Unity of Science Movement	<b>Neurath, Unified Science as Encyclopedic Integration; Dewey, Unity of Science as a Social Problem</b> ; Cat, Cartwright, and Chang; Creath, The Unity of Science
M 9/21		<b>Reisch, <i>How the Cold War...</i> Ch 3–4</b> ; Richardson, Engineering Philosophy of Science; Giere, From <i>Wissenschaftliche Philosophie</i> to Philosophy of Science; Howard, Two Left Turns Make a Right
W 9/23	Writing Day	<b>None.</b> Work on Research paper prospectus.
M 9/28	Confirmation	<b>Lipton, “Induction”</b> ; <b>Popper, The Problem of Induction</b> ; Salmon, “Rational Prediction”; Hempel, “Criteria of Confirmation”; Carnap, “The Confirmation of Laws and Theories”; <b>PGS 3, 14</b>
W 9/30		<b>Duhem, “Physical Theory and Experiment”</b> ; <b>Quine, “Two Dogmas of Empiricism”</b>
M 10/5	Evidence	Popper, “The Problem of the Empirical Basis”; <b>Hanson, “Observation”</b> ; Pickering, “Against Putting the Phenomena First”; <b>PGS 10.3</b>
W 10/7	<i>Midterm</i>	<b>None</b>
M 10/12	Evidence (cont’d)	<b>Chang, Measurement, Justification, and Scientific Progress</b> ; <b>Tristan, The Role of Measurement in Inquiry</b>

Day	Topic	Readings
W 10/14	Scientific Revolutions	<b>Kuhn, <i>Structure</i> Preface, Ch I-VIII; PGS 5</b>
M 10/19		<b>Kuhn, <i>Structure</i>, Ch IX-XIII, Postscript; PGS 6</b>
W 10/21		Watkins, "Against Normal Science"; <b>Popper, "Normal Science and Its Dangers"; Laudan, <i>Dissecting the Holist Picture of Scientific Change</i>; Doppelt, Kuhn's Epistemological Relativism</b>
M 10/26	Incommensura- bility and Rationality	<b>Oberheim and Hoyningen-Huene;</b> McMullin, "Rationality and Paradigm Change"; Popper, "The Rationality of Scientific Revolutions"; <b>PGS 7</b>
W 10/28		<b>Kuhn, <i>Objectivity, Value Judgment, and Theory Choice</i>; Feyerabend, <i>How to be a Good Empiricist</i>; Feyerabend, <i>Against Method</i> Chapter 18.</b>
M 11/2		<b>Holton, "On the Psychology of Scientists"; Shapin, "Pump and Circumstance";</b>
W 11/4	Social Context of Science	<b>Latour and Woolgar; PGS 8</b>
M 11/9		<b>Holloway, "A Lab of Her Own"; Oakley, "Interviewing Women"; PGS 9</b>
W 11/11		<b>Longino, <i>Can There Be a Feminist Science?</i>; Okruhlik, <i>Gender and the Biological Sciences</i></b>
M 11/16	The Science Wars	<b>Zammito, Chapter 8</b>
W 11/18		Rudner, <i>The Scientist Qua Scientist Makes Value Judgments</i> ; <b>Douglas, <i>Rejecting the Ideal of Value Free Science</i></b>
M 11/23		<b>Doppelt, <i>The Value Ladenness of Scientific Knowledge</i>; Longino, <i>Values and Objectivity</i></b>
W 11/25	Science & Values	<b>Putnam, <i>The Philosopher of Science's Evasion of Values</i>; Dewey, <i>Valuation and Experimental Knowledge</i>; Howard, <i>Better Red than Dead</i></b>

Day	Topic	Readings
M 11/30	Realism	Maxwell, The Ontological Status of Theoretical Entities; van Fraassen, Arguments Concerning Scientific Realism; Musgrave, Realism versus Constructive Empiricism PGS 12; Laudan, A Confutation of Convergent Realism; James R. Brown, Explaining the Success of Science
M 12/7	<i>Last Day</i>	Hacking, "Experimentation and Scientific Realism"; Fine, "The Natural Ontological Attitude"; Feyerabend, "Realism and the Historicity of Knowledge"; Godfrey-Smith, "Dewey on Naturalism, Realism and Science"
12/11		<i>Research Paper Due</i>

## Grading Policy

### Graded Assignments

Your grade will depend on the following assignments:

**Class Participation (15%)** Your intellectual contribution to class discussions and to close readings of the text undertaken in class.

**Midterm Exam (25%)** In-class, format to be discussed at least a week prior.

**Group Presentation (20%)** Presentation to the class on some major issue in the philosophy of the special sciences. Groups and topics to be determined in consultation with the professor.

**Research Paper (40%)** Assignment to be given during first 4 weeks. Contribution to some major debate in the philosophy of science, requiring outside research.

### Evaluation Standards

The following is a clarification for the purposes of this course of UTD's official policy with respect to grading standards.

- An **A** grade indicates *excellent* work. **A** work has something to say and says it well. It displays a subtle and nuanced understanding of the texts, develops arguments clearly and effectively, and reflects insightfully on the course material. It often rises above other work in terms of creativity and sophistication, or it may add something valuable to the discussion that goes beyond merely fulfilling the letter of the requirements. Only few, minor mistakes are present.

- A **B** grade indicates *good* work. Such work displays a clear understanding of the text, develops arguments consistently with a clear aim, and is thoughtful and careful. The presence of serious errors must not impair the clarity of an argument or the overall understanding of a text. **B** work is in many ways successful, but lacks the sophistication or originality of **A** work.
- A **C** grade indicates *satisfactory* work. It shows an adequate understanding of the key parts of the text. Arguments aim at a central claim, though they may rely on unsupported or insufficiently developed ideas. More serious errors may be present, so long as the central claims and basic understandings are not undermined.
- Work which deserves a grade less than **C** is considered *poor* and will display some of the following problems: it fails to show adequate understanding of the text; it fails to understand the assignment; it fails to articulate a coherent or adequate argument; it fails to reflect on the content of the course; it displays such pervasive grammatical errors as to be highly obscure in meaning.

+/- grades will be assigned, indicating work that goes a bit beyond or falls only somewhat short of the standards stated above.

## Course & Instructor Policies

### Late Work / Make-up Exams

No late work or make-up exams will be allowed without consent of the professor *prior* to the due/exam date, except in situations where University policy requires it.

### Class Attendance

While reading and writing are crucial parts of the course, the central philosophical activity is live discussion. While class will occasionally involve bits of lecture, this is merely an instrument to a more well-informed discussion. Attendance is thus considered **mandatory**.

### Classroom expectations

You are expected to have read the assignments *before* class, and it would be to your benefit to also read them again after class. You are expected to bring *all* of the texts assigned for each day's class, and have them available to refer to. You are expected to listen respectfully to the professor and your fellow students, and participate in class discussions and activities.

## **A Word About Note-Taking and Laptops**

Extensive note-taking in class is strongly discouraged, especially in those parts of class meetings that are not primarily lecture-based. Taking good notes is no guarantee of good performance in the course, and taking extensive notes can interfere with activities that make a greater contribution to your performance: listening, looking at the text, and participating in class discussion.

Thus, students should only bring laptop or handheld computers to class if they have chosen to keep the readings in electronic format. Even this is not preferable, as the temptations to distraction are high, and your reading will be done better if you can make notes in the margin. Please let the professor know if you have special concerns.

## **Technical Support**

If you experience any problems with your UTD account you may send an email to: [assist@utdallas.edu](mailto:assist@utdallas.edu) or call the UTD Helpdesk at 972 883-2911.

## **Student Conduct & Discipline**

The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UTD printed publication, A to Z Guide, which is provided to all registered students each academic year.

The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the Rules and Regulations, Series 50000, Board of Regents, The University of Texas System, and in Title V, Rules on Student Services and Activities of the university's Handbook of Operating Procedures. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391) and online at <http://www.utdallas.edu/judicialaffairs/UTDJudicialAffairs-HOPV.html>

A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

## **Academic Integrity**

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic Dishonesty, any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of [turnitin.com](http://turnitin.com), which searches the web for possible plagiarism and is over 90% effective.



## Copyright Notice

The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted materials, including music and software. Copying, displaying, reproducing, or distributing copyrighted works may infringe the copyright owner's rights and such infringement is subject to appropriate disciplinary action as well as criminal penalties provided by federal law. Usage of such material is only appropriate when that usage constitutes "fair use" under the Copyright Act. As a UT Dallas student, you are required to follow the institution's copyright policy (Policy Memorandum 84-I.3-46). For more information about the fair use exemption, see <http://www.utsystem.edu/ogc/intellectualproperty/copypol2.htm>

## Email Use

The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's U.T. Dallas email address and that faculty and staff consider email from students official only if it originates from a UTD student account. This allows the university to maintain a high degree of confidence in the identity of all individual corresponding and the security of the transmitted information. UTD furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at U.T. Dallas provides a method for students to have their U.T. Dallas mail forwarded to other accounts. Withdrawal from Class

The administration of this institution has set deadlines for withdrawal of any college-level courses. These dates and times are published in that semester's course catalog. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, I cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.

## Student Grievance Procedures

Procedures for student grievances are found in Title V, Rules on Student Services and Activities, of the university's Handbook of Operating Procedures.

In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originates (hereafter called "the respondent"). Individual faculty members retain primary responsibility for assigning grades and evaluations. If the matter cannot be resolved at that level, the grievance must be submitted in writing to the respondent with a copy of the respondent's School Dean. If the matter is not resolved by the written response provided by the respondent, the student may submit a written appeal to the School Dean. If the grievance is not resolved by the School Dean's decision, the student may make a written appeal to the Dean of Graduate or Undergraduate Education, and the dean will appoint and convene an Academic Appeals Panel. The decision of the Academic Appeals Panel is final. The results of the academic appeals process will be distributed to all involved parties.

Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations.

## Incomplete Grade Policy

As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is

not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of F.

### **Disability Services**

The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room 1.610 in the Student Union. Office hours are Monday and Thursday, 8:30 a.m. to 6:30 p.m.; Tuesday and Wednesday, 8:30 a.m. to 7:30 p.m.; and Friday, 8:30 a.m. to 5:30 p.m.

The contact information for the Office of Disability Services is: The University of Texas at Dallas, SU 22 PO Box 830688 Richardson, Texas 75083-0688 (972) 883-2098 (voice or TTY) disabilityservice@utdallas.edu

If you anticipate issues related to the format or requirements of this course, please meet with the Coordinator of Disability Services. The Coordinator is available to discuss ways to ensure your full participation in the course. If you determine that formal, disability-related accommodations are necessary, it is very important that you be registered with Disability Services to notify them of your eligibility for reasonable accommodations. Disability Services can then plan how best to coordinate your accommodations.

It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.

### **Religious Holy Days**

The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, Texas Code Annotated.

The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment.

If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of TEC 51.911(b), and the student and instructor will abide by the decision of the chief executive officer or designee.

***These descriptions and timelines are subject to change at the discretion of the Professor.***