Principles of Scientific Reasoning

History & Philosophy of Science 0611

151 Cathedral of Learning (Norwegian Room)

Monday, 6:00pm - 8:30pm

instructor:	Bryan Roberts
office:	901-P Cathedral of Learning
office hours:	1-2pm Mon & Thu or by appointment
class website:	http://www.pitt.edu/~bwr6/teaching/principles
textbook:	Salmon, Merrilee. *Introduction to Logic and Critical Thinking.* 5th edition, 4th edition, or 3rd edition (but not the 2nd or 1st editions).

Time flies like an arrow. Fruit flies like a banana.

– Groucho Marx

Course overview & objectives

This course covers the basic principles underlying good critical reasoning. You will develop the ability to precisely identify, reconstruct, and evaluate arguments of the kind found in science, and apply them to everyday life. In particular, the course will introduce the philosophical, statistical, and logical features common to good arguments. We will pay special attention to identifying fallacious arguments, and formulating sound ones. There are roughly three parts to the course:

(1) weeks 1-4:   introduction to arguments
(2) weeks 5-10:   inductive arguments
(3) weeks 11-15:   deductive systems

The first part is an overview of the structure of arguments, including a brief introduction to the distinction between inductive and deductive arguments. You will learn to identify the basic problems of ambiguity and vagueness, and practice techniques for eliminating them. The second part introduces inductive arguments, and will provide the tools you need to identify, construct and improve arguments using statistical syllogisms, analogies, causal inferences, and Bayes' theorem. You will in particular learn the basic tools and pitfalls of probability theory. The third part introduces deductive systems. We will introduce the basic features of formal languages, deductive inferences, formal satisfaction and and truth. You will then learn to identify and distinguish the concepts of validity and soundness, and how they can be applied in ordinary language and in computing systems. Along the way, you will also practice the techniques of good philosophical writing. It's never too early to start learning about this; for an introduction, see my "7 steps to a better philosophy paper": http://www.pitt.edu/~bwr6/teaching/Guide.pdf.

Assessment

You will be assessed on the basis of weekly homeworks, biweekly quizzes, and a final term paper. The grade breakdown is as follows.

40%	10 best homeworks
40%	5 best in-class quizzes
20%	term paper

Homeworks are due at the start of each class. Only your best 10 out of 13 homeworks will be counted toward your final grade. Similarly, only your best 5 out of 6 quizzes will be counted. The term paper should be roughly 1000 words, and is due on Friday, Dec 11 before midnight. For a summary of the dates on which coursework is due, see the class schedule below, or visit the class homepage: http://www.pitt.edu/~bwr6/teaching/principles. For more information about the term paper requirements, see the term paper page at http://www.pitt.edu/~bwr6/teaching/principles/termpaper.html.

No late assignments, no makeup quizzes

Homeworks are due at the start of class. No late assignments will be accepted. Instead, since the assignment grade is best 10 out of 13, you will be forgiven automatically if you miss up to three assignments. Similarly, no makeup quizzes will be given. Since the quiz grade is best 5 out of 6, one missed quiz will be forgiven automatically. It is strongly recommended that the forgiven quiz and assignments be used only when illness or emergencies prevent you from making it to class. This strategy will simplify your life and mine.

Academic integrity

No students may bring any unauthorized materials to an exam, including dictionaries and programmable calculators. Students will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the official procedural process, initiated at the instructor level, as outlined in the University Guidlines on Academic Integrity.

Special needs

If you have a disability for which you are or may be requesting special accommodations, you are welcomed and encouraged to contact both myself as well as Disability Resources and Services, 216 William Pitt Union, 412-648-7890 (Voice or TTD) as early as possible in the term. For more information, visit: www.drs.pitt.edu.

How to do well in this course

I hope this will be one of the most useful courses you ever take. Understanding *deeply* what good arguments will help you get a job, decide the future direction of your company, or formulate a reasonable belief about a political candidate. But recognize that good argumentative skills require diligence and practice. Come to class having studied the readings as best you can, take notes in class, and then review the material again when you go home. Discuss the material with your classmates. Do your homeworks, and make sure you understand any questions that you miss. You are very, very welcome to get in touch with me to discuss difficulties when you run into them. I am available in office hours, and will respond to email within 24 hours. Remember, philosophy takes some time to process. That is normal. The more time you give yourself, the more likely you'll be to succeed.

Class schedule

The coursework for each class is summarized below. You are expected to come to class having already completed the readings for to the best of your ability. Readings are in [brackets] in

the schedule below. The key is: [ms 1.III] = class textbook (Merilee Salmon, 5th edition) chapter 1 section 3. The chapters are changed slightly in other editions of the textbook; a summary of the weekly readings for these editions is posted on the class website: http://www.pitt.edu/~bwr6/teaching/principles/readings.html.

date	topic	homework due	quiz
Part 1			
31-aug-09	introduction	-	-
07-sep-09	no class (labor day)	-	-
14-sep-09	ambiguity & vagueness [ms 1-2]	hw 1	-
21-sep-09	deduction & induction [ms 3]	hw 2	quiz 1
Part 2			
28-sep-09	statistical syllogisms [ms 4.I-II]	hw 3	-
05-oct-09	analogies and samples [ms 4.III,IV,VII]	hw 4	quiz 2
13-oct-09	causal arguments [ms 5]	hw 5	-
19-oct-09	intro to probability [ms 6.I-II]	hw 6	quiz 3
26-oct-09	using probability [ms 6.III-IV]	hw 7	-
02-nov-09	confirmation [ms 7]	hw 8	quiz 4
Part 3			
09-nov-09	intro to deductive systems [ms 8.I-V]	hw 9	-
16-nov-09	truth, validity, soundness [ms 8.IX-XII]	hw 10	quiz 5
23-nov-09	logic gates [notes]	hw 11	-
30-nov-09	ordinary language [ms 9.III,VIII]	hw 12	-
07-dec-09	term paper workshop [guide]	hw 13	quiz 6