

PHIL 340: Philosophy of Science

Spring 2012, Coastal Carolina University

MWF 12:00-12:50 p.m., Edwards 166

Professor	Dennis Earl								
Email, phone	dearl@coastal.edu , (843-349-2787)								
Office hours	Edwards 278: MWF 1:00-2:00, T/Th 10:00-2:00; also by appointment								
Important web addresses:	My CCU webpages: http://ww2.coastal.edu/dearl Blackboard login page: https://learn.coastal.edu/ (for uploading paper assignments)								
Catalog description	(Prereq: PHIL 101 or permission of instructor) A critical examination of methods and concepts of the sciences. Topics include scientific revolutions, the unity of science, experimentation, explanation, and evidence.								
Course objectives (general things you should learn)	In general, upon successful completion of this course, you can expect to: <ul style="list-style-type: none"> (1) understand some of the central issues in the philosophy of science (2) be able to think critically and philosophically about science itself, by way of applying the understanding gained in (1) (3) be able to articulate the issues and arguments of our course clearly, both orally and in writing (4) be smarter 								
Student learning outcomes (more specific things you should learn, on which you'll be evaluated):	By the end of this course, you will be able to: <ul style="list-style-type: none"> (1) explain some philosophical problems unique to science and empirical reasoning generally, including those concerning: <ul style="list-style-type: none"> the difference between science and non-science scientific reasoning scientific explanation and the laws of nature the "reduction" of one theory to another scientific theories and observation realism and anti-realism about theoretical entities the relation and conflicts between science and religion (2) explain the central views concerning the problems given in (1) (3) critically evaluate the views given in (2) and the arguments in favor of them (4) formulate and defend your own views concerning the views and arguments given in (1)–(3) 								
Course requirements	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">papers (5 in all, 3-4 pp. each)</td> <td style="text-align: center; padding: 5px;">50%</td> </tr> <tr> <td style="padding: 5px;">final exam (4 short essays)</td> <td style="text-align: center; padding: 5px;">20%</td> </tr> <tr> <td style="padding: 5px;">quizzes (lowest two dropped)</td> <td style="text-align: center; padding: 5px;">30%</td> </tr> <tr> <td style="padding: 5px;">Total</td> <td style="text-align: center; padding: 5px;">100%</td> </tr> </table> <p>I reserve the right to make adjustments to the grading scheme, the number of assignments, due dates, and the overall course plan as necessary.</p>	papers (5 in all, 3-4 pp. each)	50%	final exam (4 short essays)	20%	quizzes (lowest two dropped)	30%	Total	100%
papers (5 in all, 3-4 pp. each)	50%								
final exam (4 short essays)	20%								
quizzes (lowest two dropped)	30%								
Total	100%								
Grading scale	A \geq 90%; 85% \geq B+ $>$ 90%; 80% \geq B $>$ 85%; 75% \geq C+ $>$ 80%; 70% \geq C $>$ 75%; 65% \geq D+ $>$ 70%; 60% \geq D $>$ 65%; F $<$ 60%								

Attendance policy	Attendance is required. The <i>CCU University Catalog</i> states that “An instructor is permitted to impose a penalty, including assigning the grade of F, for unexcused absences in excess of 25% of the regularly scheduled class meetings.” I’ll take attendance, and if you miss more than 25% of our class meetings with unexcused absences, the penalty is an F for the course.
Course description	<p>There is no doubt that a substantial part of our world is and will continue to be shaped by science and technology. To be educated people, whether as practicing scientists or not, we must thus understand science and its basic philosophical concepts. Our course examines and critically discusses philosophical issues about science. We’re after the truth here, not about the world (since science does that) but about science and its basic concepts. Here are some questions we’ll consider:</p> <p>What is science? (as opposed to philosophy, mathematics, religion, politics, or history)</p> <p>What is scientific reasoning? (as opposed to reasoning in everyday life or in fields other than science)</p> <p>What is it to explain something scientifically? What is an explanation?</p> <p>What is a law of nature?</p> <p>What is a scientific theory?</p> <p>Does everything in science “reduce” to one field, like physics?</p> <p>What is the relationship between theory and observation? Which is more fundamental?</p> <p>Are theoretical, unobserved things like electrons and quarks real? Or are they “useful fictions” or something like that?</p> <p>Are science and religion compatible?</p> <p>Notice that none of these questions are scientific questions. Instead, they’re questions about the nature of science itself. That makes them <i>philosophical</i> questions, and thus we have our course.</p>
Text	Theodore Schick (Ed.), <i>Readings in the Philosophy of Science: From Positivism to Postmodernism</i> (Mayfield, 2000).
Descriptions of course requirements	
In-class quizzes	Expect a large number of these—I’ll likely have stretches of class meetings with a quiz most every time we meet. This motivates you to keep up, and it also helps me gauge how well everyone is doing, what needs more attention, etc. (The lowest two quizzes will be dropped.)
Short papers (3-4 pp. each)	<p>Five of these are required, and all will require argumentative work on your part by way of critically examining the views and arguments of the course. Papers are due on Blackboard at the SafeAssign link from the main content page. SafeAssign checks for plagiarized work, but really I’m using electronic submissions for convenience on both our parts, and for ecological friendliness too. See the schedule for due dates.</p> <p><i>Paper resubmission policy:</i> You have the option to resubmit any one of the first four papers, with the possibility of receiving a grade as much as 30 points higher than the original. (You can’t get higher than a 100 though.) <u>Resubmissions need to be submitted electronically (on Blackboard, as with the other papers) by 11:30 p.m. on the day of our last class meeting.</u> (Papers originally turned in late may be resubmitted, but with the late penalty still applied.)</p>

Final exam	The final exam is composed of a set of short essays to be submitted on Blackboard. The exam will give you a choice of questions to answer, probably with a total of four questions to be answered in all. Each question will need about a page or so to answer properly. The exam is due on Blackboard by the end of the scheduled exam period for our course, which is <u>Monday, April 30 at 3:30 p.m.</u>
Course policies	
Excused absences and extensions	<p>The <i>Catalog</i> states that “Absences will be excused for documented cases of:</p> <ul style="list-style-type: none"> a) incapacitating illness, b) official representation of the University (excuses for official representation of the University should be obtained from the official supervising the activity), c) death of a close relative, and d) religious holidays.” <p>I’ll decide on other types of circumstances as they might arise, but please don’t expect me to be accommodating concerning possibilities that go much beyond those given in the Catalog. The reason for the policy concerning excused absences is this: <u>Quizzes missed due to excused absences will not be included in the final quiz grade calculation (and thus your other quiz grades will count proportionately more). Quizzes missed due to unexcused absences will receive a grade of zero.</u> If absences of any kind coincide with a due date for a paper, you’ll need to let me know what’s going on, most preferably <i>before</i> the due date. Extensions are possible within the guidelines for absences given above.</p>
Late assignments	Unless otherwise specified, all written assignments (the papers and the final exam) are due at the given due date and time. <u>Ten points will be deducted for late papers, with an additional ten points for each further <i>calendar day</i> the assignment is late.</u> Some leniency may be expected for documented excuses of types (a)-(d) above, and perhaps others, the leniency being at the instructor’s discretion.
Academic misconduct	<p>The <i>CCU Student Code of Conduct</i> (URL: http://www.coastal.edu/conduct/documents/codeofconduct.pdf) includes a statement of community standards for academic integrity, which reads as follows:</p> <p>Coastal Carolina University is an academic community that expects the highest standards of honesty, integrity and personal responsibility. Members of this community are accountable for their actions and are committed to creating an atmosphere of mutual respect and trust.</p> <p><u>If you are caught committing an academic infraction your action will be reported to the university and my standard sanction is an FX grade for the course.</u> See the Code of Conduct for examples of plagiarism and cheating, as well as procedures and your rights as a student regarding charges of misconduct.</p>

Class atmosphere	<p>Our class meetings need to be focused on our material, with very few distractions. Important maxims to keep in mind are these:</p> <ul style="list-style-type: none"> • Come to class prepared, having read the material for the day very carefully. I aim to have quizzes very often. Bring your book: For many quizzes, I'll let you use it and any notes you have. • Put your phone away before class starts. • Don't arrive late or leave early, unless you've cleared it with me beforehand. • Be ready to participate in class and discuss our material actively and critically. You need to be ready to be called upon, both for facilitating discussion and for my gauging your understanding of our material. If you're not attentive, I'll let you know. • Uncivil behavior will not be tolerated, where such behavior includes anything disruptive to the learning environment for our course. This can be active or passive: Obnoxious behavior in class obviously counts, but also any behavior (whether verbal or not) that distracts me or other students from our respective tasks in our course. Excessive or perspicuous cases will be handled as a violation of the <i>Student Code of Conduct</i>.
Communications	<p>If I need to contact you, I'll use your <i>coastal.edu</i> address unless I'm replying to a message you've sent me using another address. Use your <i>coastal.edu</i> account or have its email forwarded to an account you check regularly. ("Regularly" means "daily at least.") Email I send to everyone in the class will go to your <i>coastal.edu</i> address.</p> <p>As for contacting me, emailing me at dearl@coastal.edu is the best option. I'll usually respond to messages requiring a reply within twenty-four hours, often much less. In emailing me, please observe the standards of professional writing.</p>
Special needs	<p>If you have a physical or documented mental disability, see me to make the appropriate arrangements for you to complete the course in a way suitable for you. In order to receive such compensation, you need to register with the Services for Students with Disabilities Office (in the Student Counseling Center, 204 University Blvd., phone 349-2305, website http://www.coastal.edu/counseling/disabilityservices.html).</p>

<i>Course schedule</i>		
<ul style="list-style-type: none"> • All readings are in the textbook unless otherwise specified. • Readings are listed in the right column of table below, and are listed by the day the reading in question will be discussed. For example, January 18 lists a reading by Karl Popper as the reading for the day. So read that article by Popper for that day's class meeting. • Other supplemental materials may be handed out in class, posted online at our course webpage and on Blackboard, or linked to from the same. 		
<i>Date</i>	<i>Topic</i>	<i>Readings/activities/assignments due</i>
M, Jan. 9	Introduction to the course The nature of philosophy Science and philosophy	This syllabus
W, Jan. 11 ¹	The nature of science What is science? How do we distinguish science from non-science? Science as verification (the verificationist or positivist account of science)	Introduction to Part 1 ("Science and nonscience: Defining the boundary") A.J. Ayer, "The elimination of metaphysics"
F, Jan. 13	Positivism, continued	
M, Jan. 16	Martin Luther King, Jr. holiday	
W, Jan. 18	Science as falsification (the falsificationist account of science)	Karl Popper, "Science: Conjectures and refutations"
F, Jan. 20	Falsificationism, continued	
M, Jan. 23	Science as "puzzle solving"	Thomas Kuhn, "Logic of discovery or psychology of research?" Paper #1 due on Blackboard by 11:30 p.m.
W, Jan. 25	Scientific reasoning and the problem of induction What is the relation between a theory and the reasons/evidence for it? The problem of induction	Introduction to Part 2 ("Induction and confirmation: The nature of scientific inference") David Hume, "The problem of induction"
F, Jan. 27	The hypothetico-deductive method	Carl Hempel, "The role of induction in scientific inquiry"
M, Jan. 30	The method of conjecture and refutation (falsificationism)	Karl Popper, "The problem of induction"
W, Feb. 1	The underdetermination of scientific theories by the evidence	Pierre Duhem, "Physical theory and experiment"
F, Feb. 3	The method of inference to the best explanation (or abduction)	Peter Lipton, "Contrastive inference" Paper #2 due on Blackboard by 11:30 p.m.

¹ Thursday, January 12 is the last day to add the course or to drop with no academic record.

M, Feb. 6	Scientific explanation and the laws of nature What is an explanation? The deductive-nomological model of explanation	Introduction to Part 3 (“Laws and explanation: The nature of scientific theories”) Carl Hempel, “Laws and their role in scientific explanations”
W, Feb. 8	The D-N model, continued	
F, Feb. 10	The causal model of explanation	Wesley Salmon, “Why ask, ‘Why?’?”
M, Feb. 13	The causal model, continued	
W, Feb. 15	The pragmatic model of explanation	Bas van Fraassen, “The pragmatics of explanation”
F, Feb. 17	The unification model of explanation	Philip Kitcher, “Explanatory unification”
M, Feb. 20	Catch up as necessary	
W, Feb. 22	Reductionism	Introduction to Part 4 (“The unity of science: Are all sciences reducible to physics?”) Paul Oppenheim and Hilary Putnam, “Unity of science as a working hypothesis”
F, Feb. 24	Class cancellation—I’ll be at a conference	
M, Feb. 27	Reductionism, continued	Paper #3 due on Blackboard by 11:30 p.m.
W, Feb. 29	Scientific theories and observation What is a theory? What is the relation between theory and observation? The observation language vs. the theoretical language	Introduction to Part 5 (“Theory and observation: Is seeing believing?”) Rudolf Carnap, “The methodological character of theoretical concepts”
F, Mar. 2	The dependence of meaning on theory	Mary Hesse, “Is there an independent observation language?”
M, Mar. 5	The dependence of observation on theory	N.R. Hanson, “Observation”
W, Mar. 7	The dependence of observation on theory, continued	
F, Mar. 9	Kuhnian paradigms	Thomas Kuhn, “The Structure of scientific revolutions”
M, Mar. 12- F, Mar. 16	Spring Break	
M, Mar. 19	Kuhn, continued	
W, Mar. 21 ²	The rationality of paradigm shifts	Larry Laudan, “A problem-solving approach to scientific progress” Paper #4 due on Blackboard by 11:30 p.m.
F, Mar. 23	Realism and Anti-Realism about theoretical entities The reality of theoretical entities or “unobservables”	Introduction to Part 7 (“Realism and Antirealism: Does science reveal reality?”) Grover Maxwell, “The ontological status of theoretical entities”
M, Mar. 26	Realism about theoretical entities, continued	

² Thursday, March 22 is the last day to drop with grade of ‘W’.

W, Mar. 28	The irreality of “unobservables”	Bas van Frassen, “Constructive empiricism”
F, Mar. 30- S, Mar. 31	Celebration of Inquiry	
M, Apr. 2	Anti-Realism about theoretical entities, continued	
W, Apr. 4	The reality of scientific theories	Paul Churchland, “The Anti-Realist epistemology of van Frassen’s <i>The Scientific Image</i> ”
F, Apr. 6	Student holiday	
M, Apr. 9	Realism vs. Anti-Realism, continued	
W, Apr. 11	Science and religion Science as religion	Introduction to Part 8 (“Science and religion: Reason versus faith”) Paul Feyerabend, “Science and myth”
F, Apr. 13	Science as religion, continued	Paper #5 due on Blackboard by 11:30 p.m.
M, Apr. 16	Science as not a religion	Richard Dawkins, “Is science a religion?”
W, Apr. 18	The relation between science and religion, continued	
F, Apr. 20	Science as able to explain everything?	Peter Atkins, “Purposeless people”
M, Apr. 23 ³	What science perhaps cannot explain	Martin Gardner, “Science and the unknowable”
W, Apr. 25		Paper resubmissions due
M, Apr. 30	Final exam due by 3:30 p.m. ⁴	

³ Tuesday, April 24 is the last day to drop with a grade of ‘WF’.

⁴ The complete final exam schedule for Spring 2012 is at http://www.coastal.edu/registrar/documents/12SP_Exam_Schedule.pdf.