

Freshman Seminar (Syllabus)

Chem 199: Weird Science

CRN: 16480

Syllabus for Fall 2010

Instructor: John Donovan

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Class Times: Tues, Thur: 12:00-1:50 PM

Classroom: 2 Earl International House

Office Hours: 74 Huestis Hall, Mon, Wed: 11:00-12:00 PM, or by appointment

Description:

Science is a powerful tool to understand and explain the natural world we all live in. Because of its apparent success in so many areas of our everyday lives, there are many instances in which individuals or groups claim that certain strongly or emotionally held beliefs are “scientific” or are supported by “scientific” studies. Even some scientists may make unwarranted claims of scientific “truth” (e.g., Scientism). How can the public, often without specialized scientific training, distinguish between scientific and pseudo-scientific claims?

This course will attempt to teach how to separate reasonable and unreasonable claims by learning how science tackles difficult problems. The key is to be skeptical, but not too skeptical. We will examine a number of beliefs, including paranormal effects, alternative medicine, creationism and intelligent design, recovered memory syndrome, pseudo-scientific devices (e.g., dousing, free energy machines, fuel efficiency extenders, etc.) that all profess to be scientific, and try to explain the psychology behind this clearly human need to believe.

Instruction:

The seminar will consist of several components designed to stimulate critical thinking through class discussion and essay writing with 10 writing assignments in the first half of the class. There will be assigned reading from several books and one or two videos to be viewed in class.

There will be a midterm essay style exam with 10 questions covering the material from the first half of the class.

Subsequently the class will be arbitrarily divided into a number of pro and con groups to examine, present and discuss several specific pseudo-scientific topics in detail (to be determined by the instructor with suggestions from the class). These topics will be presented by the students as an 8-10 minute formal oral presentation in the second half of the class.

A final 5-8 page paper based on the student presentations and subsequent discussions will complete the course

Required Textbooks:

- Jonathan C. Smith's, Pseudoscience and Extraordinary Claims of the Paranormal
- Michael Shermer's "Why People Believe Weird Things"
- Carl Sagan's "The Demon haunted World"

The above text books do not need to be brought to class. Reading assignments will be given for various chapters in the required text books. These books are available at the University of Oregon Bookstore.

Some assigned reading will be on electronic reserve on the University of Oregon Library website:

http://libweb.uoregon.edu/acs_svc/reserve-index.html

Go to the URL above and enter Chem 199 as the course and using the login "fall10" and password "pumpkin" to access the assigned reading.

Outline:

Part I: Science looks at the paranormal and the basics of the scientific method

- Brian Silver, "Newton gets It Completely Wrong", James (the Amazing) randi, Flim Flam Chapter 2 ("Fairies at the Foot of the Garden")
- NOVA video: Secrets of the Psychics (featuring J. Randi)
- Handout on the "Clever Hans" effect
- Handout and Discussion on Scientific methods
- Phenomena exemplifying strengths and weaknesses of scientific method
- Michael Shermer: Chapter 3 (25 Thinking Fallacies) and Chapter 17 (Why We Believe Weird Things)

Midterm (question and answer exam)

Part II: Investigation, Presentation and Discussion

- Paranormal Experiments and Video/DVD presentations
- Student presentations of selected pseudo-scientific beliefs
- Discussion of presentations

Final (5 page essay- summary of a selected presentation and discussion)

Requirements:

Selected readings from:

- Jonathan C. Smith's, Pseudoscience and Extraordinary Claims of the Paranormal
- Michael Shermer's "Why People Believe Weird Things"
- Carl Sagan's "The Demon haunted World"
- Wendy Kaminer's "Sleeping With Extra-terrestrials"

- Selected articles from “Skeptical Inquirer” magazine

Videos: PBS’s NOVA, Scientific American Frontiers and Frontline series.

By the end of the class, students will be expected to know:

- What is a scientific theory and how it differs from popular usage of the word
- How intuitive concepts such as tradition, authority and revelation are often (but not always) unreliable means to gaining knowledge
- What sciences can and can’t prove about the paranormal and other beliefs
- 20 ways that para-normalists fool naïve observers
- What is strong scientific evidence and what is weak.
- What is the “placebo effect” and why is it controversial
- What is blind and double-blind testing and why are they valuable
- What constitutes a scientific explanation
- The self-correcting nature of science
- The role of uncertainty in science
- The difference between science and pseudo-science
- The difference between rationalism and dogmatism

25 fallacies that support irrational thought and behavior, including:

- 3 problems with scientific thinking (e.g., theory influencing observation)
- 12 problems with pseudoscientific thinking (e.g. anecdotal evidence)
- 7 logical problems (e.g., ad hominem and ad ignoratiam arguments)
- 3 psychological problems (e.g., the need for certainty and simplicity).

Critical Evaluation of Sources

The ability to evaluate the reliability and scholarship of source material is an essential component of the pursuit of knowledge. Students will be given class work in critical examination of newspaper articles, web sites, and popular writings. The UofO science library provides a useful site with information pertaining to this issue:

<http://libweb.uoregon.edu/guides/findarticles/credibility.html>

Policies:

Academic Honesty: Some of the work in this class will be of a collaborative nature. However, you are expected to write the reports and papers entirely on your own. Don’t even think about trying to download from the Internet and turn in a single sentence that is not your own. Information on the Internet is not “public domain”. Someone wrote it (maybe even someone named “anonymous”) and **all work from any source not your own must be attributed**. You are expected to be familiar with and abide by the University’s guidelines on plagiarism. Cases of academic dishonesty will result in a grade of F for this class and possible further action by the university.

See: <http://libweb.uoregon.edu/guides/plagiarism/students/> for more information.

Late Work, Absences, and Make-Ups:

Because this class depends to a large extent of class participation in discussion and exploration of complex issues, absences are largely impossible to make up and are significantly detrimental

to your learning the material. You will be allowed to miss one class due to serious illness or death in your immediate family. One additional excused absence may (or may not be) be allowed at my discretion. However, if you miss more than 2 classes for any reason, you will not receive credit for this course.

Late assignments will lose points. If the assignment is handed in the day due but not at the beginning of class (or at the assigned time), 10% of the points will be deducted from the total earned. If the assignment is handed in the next day, 20% of the points will be deducted. After one day, no late assignments will be accepted. If exceptional circumstances make it difficult for you to complete an assignment on time, notify me well in advance, and I may grant you an extension, at my discretion.

Assignments

You are expected to be prepared for each lecture and discussion by reading the assigned material and completing all assigned writing before each class. One of the main goals of this course is to improve your critical writing skills which are essential to a successful college career. All work **MUST** be typed (double-spaced) and submitted as a hard copy **IN** class on the day assigned or as a Word, Text or PDF file via email attachment **BEFORE** class on the day assigned. I shouldn't have to mention that all work must be titled, with the class, instructor, date and student's name on the first page.

I will not accept handwritten material for the simple reason that the process of critical writing requires several iterations of re-reading, editing and re-writing. This is impractical with handwritten assignments.

If you do not have a computer, please see me. There are computer facilities throughout the campus and library, and if worse comes to worse, I have a computer in my lab that is available for your use.

It is expected that all students have formal college level essay writing skills. The university does not offer classes in grammar, spelling and punctuation for this reason. In addition, all students are expected to be able to write clearly, concisely using complete sentences, with well connected statements and evidence supported ideas. If you cannot effectively express and communicate your ideas in writing you will be at a severe disadvantage. However, there are consultation and tutoring services offered on-campus. If you think that your writing skills are in need of improvement, please contact Academic Learning Services at:

<http://als.uoregon.edu/services/services.html>

or call (541) 346-3226.

Mid Term Exam

A midterm will test your mastery of the concepts presented in the first unit in the form of 10 short essay responses. These ideas represent the knowledge foundation of the course and are essential for proper design and presentation of the topics in the second unit.

Class Readings of Assigned Writings:

You will be asked occasionally to read aloud the work of another classmate. You will not reveal the author of the work, unless you have permission from the author. The reading should be done in a measured and audible manner with an effort to present the information as effectively as possible. You may be asked to pose a number of questions to the class designed to facilitate discussion by the class as a whole.

Oral Presentation of Individual Projects:

Presentations and discussions will begin in Unit 2. A list of topics will be circulated so that you

can list your preferences for the topics. Please feel free to discuss your ideas and/or choices with me on topics of presentation and discussion. You may want to have you and your partner present pro and con sides of the topic.

You will present your project (the research question or issue, your hypothesis, your research into the subject and you will co-lead a discussion of the topic with special attention to politeness, inclusiveness and etiquette) to the class. Each student's presentation will last approximately 8-12 minutes. *Guidelines for content and format of the presentations will be distributed as the project unit begins or see my web page for an on-line copy of the guidelines:*

<http://epmlab.uoregon.edu/weird.htm>

Final Paper:

You are required to write up the presentation of your individual project as a formal paper of 5-8 pages using standard academic writing styles and formats. This is not meant to be a mere transcription of your verbal presentation, but rather a serious academic paper that discusses the subject from both believer and skeptic viewpoints. It is essential that the paper examine the validity of the arguments presented by both sides with special attention to the tools provided for critical thinking that we will have covered during the course. *Guidelines for the paper will be distributed.*

Grading:

Your semester grade will be based on 600 total points from the following sources:

Class participation: 100

Reading Summaries (10 x 10 points each): 100

Mid Term Exam: 100 points

Team Project Presentation: 100 to each team member

Final Paper: 200

TOTAL: 600 points

Grades will be assigned as follows: 90%-100% = A range; 80%-89% = B range; 70%-79% = C range; 60%-69% = D range; below 60% = F. No plus or minus grades will be given.