PHILOSOPHY 325
ENGINEERING ETHICS

BULLETIN INFORMATION
PHIL 325: Engineering Ethics (3 credit hours)
Course Description:
An investigation of ethical issues in engineering and engineering-related technology. Topics include whistleblowing, employee/employer relations, environmental issues, issues related to advances in information technology, and privacy.

SAMPLE COURSE OVERVIEW
Engineering ethics involves two related skills: the ability to analyze complex socio-political problems concerning the design, manufacturing, and use of technologies and their technological systems and the ability to communicate reasonably and persuasively about such analyses. In this course we develop both sets of skills through lectures, discussions, written and oral assignments, focusing on the examination of several case studies concerning real technologies in society.

ITEMIZED LEARNING OUTCOMES
Upon successful completion of Philosophy 325, students will be able to:
1. Identify the source and function of values through the investigation of technology in society.
2. Demonstrate an understanding of the importance of values, ethics, and social responsibility for the self and contemporary society within the framework of the engineering profession.
3. Demonstrate the ability to reflect on how values shape personal, professional, and community ethics and decision-making.
4. Identify and demonstrate appropriate means of communication for varied audiences and purposes.
5. Demonstrate the ability to reason clearly in speaking and writing to inform, persuade, and exchange views.
6. Articulate a critical and informed position on an issue and engage in productive and responsible intellectual exchanges that demonstrate the ability to grasp and respond to other positions as well as set forth their own.

SAMPLE REQUIRED TEXTS/SUGGESTED READINGS/MATERIALS
3. **NOTE:** Chapters in Zarefsky are assigned out of order. Some chapters are assigned twice in order to return to review and discuss concepts introduced earlier in the semester. Students will also be encouraged to use the book as a reference, seeking information on the problems they encounter in planning and presenting their speeches.

4. **General Readings:**

5. **Case Study readings (posted to Blackboard):** In many cases, these are extensive readings. Students are expected to familiarize themselves with the cases to the extent necessary for informed discussion and oral presentation. Discovering how much information is needed is one of the skills students are expected to develop through this process. This serves the course requirement that students develop “critical approaches to topic selection, subject appropriate research, and the identification of controversy in complex issues.” **THESE ARE SAMPLES OF THE TYPES OF CASES AND READING USED IN THE COURSE; ACTUAL CASES CHANGE EACH SEMESTER TO PROVIDE TOPICAL AND RELEVANT MATERIAL.**

6. **Fuel Cell Technology**

7. **Love Canal**
8. World Trade Center
      WERS_GRAPHIC.html
   c. Thomas W. Eagar and Christopher Musso, “Why Did the World Trade Center
   d. NST Engineering Laboratory, “World Trade Center Disaster Study,”
      http://www.nist.gov/el/disasterstudies/wtc/
9. Hyatt Regency Walkway Collapse
   b. MATDEL, “Building Collapse Cases/Hyatt Regency Walkway,”
      http://matdl.org/failurecases/Building_Collapse_Cases/Hyatt_Regency_Walkway
   c. NatGeo, “Hyatt Walkway Collapse” on Youtube:
      http://www.youtube.com/watch?v=yoGGMdktsRM
10. Three Mile Island
    a. U.S. NRC, “Background on the Three Mile Island Accident,”
    c. Film: The China Syndrome (1979)
    d. The American Experience, Meltdown at Three Mile Island (PBS documentary)
       (ch. 2 “The Regulation of Nuclear Power”)
    f. Union of Concerned Scientists, “Clean Energy: Three Mile Island’s Puzzling
       Legacy
    h. University of Pittsburgh, Center for Politics Case Study: “The Media’s Role in High
       Risk Conditions: Community Right to Know versus Public Information
       Management”
11. Challenger


12. Fukushima Daiichi Nuclear Power Plant


   http://cryptome.org/eyeball/daiichi-npp/daiichi-photos.htm

d. Eliza Strickland, “24 Hours at Fukushima” *IEEE Spectrum*, November 2011,
   http://spectrum.ieee.org/energy/nuclear/24-hours-at-fukushima/0

13. Therac-25


14. BP Oil Spill

a. National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, *Deepwater: The Gulf Oil Disaster and the Future of Offshore Drilling*
   http://www.oilspillcommission.gov/sites/default/files/documents/DEEPWATER_ReporttothePresident_FINAL.pdf

   www.nap.edu/catalog/13047.html

15. ABS


16. Ford Explorer Rollovers


   http://www.citizen.org/documents/Joan_Claybrook%27s_Testimony_on_CAFE.pdf

17. Hoover Dam

18. Arsenic Water Contamination

SAMPLE ASSIGNMENTS AND/OR EXAMS
1. Oral Presentations of Cases—For each case study discussion (13 over the semester), there will be 4 students appointed to be discussion leaders or discussants, who will introduce the various dimensions of the case in order to generate some discussion. Every student will present once and act as a discussant once. The discussion leaders will prepare and deliver a 4-6 minute speech constituting an informative introduction to the case, explaining what happened, why, and who the responsible parties are (providing an opportunity to offer informative speaking). The leaders will also identify the values in the case discuss their sources and functions, show how they played important roles and shaped decision making in the case. The two discussants are to prepare and present 4-6 minute speeches that provide specific normative claims about the case; their
presentations will be argumentative. They should discuss what actors in the case should have done and why and anticipate counter arguments. This speech requires ethical analysis and reasoning, discussion of how values ought to inform decision making and professional standards. Furthermore, it requires the application of argumentation, engaging the audience of the class, and provides an opportunity to reflect on ethical choices at hand in the case. The students not assigned to the case will exercise their critical listening skills and in the second half of the discussion will be invited to engage in a productive and responsible exchange with the presenters.

a. Every student will give one 4-6 minute presentation as a discussion leader and one as a discussant.

2. **Homework Assignments** – There are four homework assignments; these are moderately large, well-defined, projects. Each is given in the form of a decision worksheet (a model developed at USC by Charlie Pierce and Juan Caicedo in the department of Civil and Environmental Engineering) and a format that most of USC engineering students are now familiar with. For example, one decision worksheet (probably the last one due, since it requires sophisticated skills developed over the course of the semester) asks the students to consider what to do in the case of the GM side-saddle gas tank recall. They must estimate the cost of the recall, calculating the cost of the repair, considering the number of vehicles in service, and any other related costs. They must then design a solution that can be retrofit onto the vehicles. Lastly they must video-record themselves providing a 5 minute speech to the CEO of GM arguing in favor of the recall and providing the ethical reasoning in support of a decision to recall. Other worksheets are similar and each will include oral communication dimensions on video, as well. Assignments facilitate assessment of ethical reasoning, the identification of relevant values and professional standards, their sources, functions, and importance. In addition, homework assignments help to provide assessment mechanisms of students’ ability to demonstrate appropriate means of communication for different audiences. This accounts for four graded assessments.

3. **Quizzes** – Each week there is a quiz requiring students to reflect on the week’s reading assignment and the case study being discussed. These quizzes provide an opportunity to assess the development of skills in identifying values, norms, and ethical principles and their sources and functions; to demonstrate how values affect individuals and societies in specific cases; and to reflect on the ways that values inform community ethics and decision making. They also cover the textbook to ensure compliance with the reading in the Public Speaking text and assess students’ understanding of basic principles of public speaking. There will be 13 quizzes total; they are listed in the course outline. (NB – Quizzes are taken online using Blackboard, so do not use class time. This has been the practice in PHIL 325 for the past year.)

4. **Writing assignment** – In preparation for the final oral project, students must write a 2,000 word essay (approximately 7-10 pages) exploring a ethical case study. The case study should be that has NOT been well developed in the engineering ethics literature.
Typically these cases are recent and often local to South Carolina, often examinations of issues what are currently unfolding. Students must do research on the case, using journalistic and other sources (e.g., official reports if available), and use ethical reasoning to construct a case study with an ethical recommendation. The essay should identify the values of relevance and their sources, show why these values are important for the community in question, and demonstrate the relevance of these values for decision making. The essay allows assessment of the students’ ability to reason clearly in writing to inform, persuade, and exchange views.

5. **Final project** – For the final project, students will transform their research paper into an oral presentation with a visual aid (a poster). The form of this assignment will be a conference style poster session in which each student presents a poster and a speech about the case their paper explored. Each student will present their case study on a poster and present a 10 minute speech about the case, identifying values and their sources, showing the importance of these values to self and community, and reflecting on the ways values shape and ought to shape decisions. The speech and visual aid must provide evidence of the student’s ability to reason normatively using ethical theories and frameworks. Students will then answer the instructor’s questions about their case. In addition, the session will be open to USC faculty and students, who will provide additional opportunities for intellectual exchanges, albeit ungraded ones. The last two classes will be used to rehearse speeches in small groups, and provide peer commentary on the speeches, including both content and presentation style. This assignment facilitates assessment of the students’ ability to reason clearly in speaking, and to inform, persuade and exchange views, as well as to articulate an informed position and engage in critical exchanges that demonstrate the ability to grasp and respond to other positions. Students are graded on their in-class rehearsal, written feedback to their peers during rehearsals, the final speech and their poster.

**SAMPLE COURSE OUTLINE WITH TIMELINE OF TOPICS, READINGS/ASSIGNMENTS, EXAMS/PROJECTS**

**SECTION I: FRAMING ENGINEERING ETHICS**

**Introduction:** What is ethics? How can we identify relevant values and their sources and functions? What is effective, informative, and persuasive public communication?

**VSR:** Preparation for identifying values, norms, and principles.

**CSM:** Preparation for identifying and demonstrating appropriate means of communication for varied audiences, and for the principles of listening with respect to fulfilling the obligations of an audience member.

**Reading Assigned** (due end of the week): Zarefsky, ch. 1 (Intro)

**Where do engineers come from? What are they responsible for? Why do societies need them? Why do engineers need the public trust?**

**VSR:** Preparation for how values inform the way professionals understand themselves; core competency needed to analyze and use ethical codes.

**CSM:** Identification of audiences for argumentative and informative speech.
Reading Assigned (due end of the week): NSPE Code of Ethics

**Ethical Obligations and the Engineering Profession**

**VSR:** Discussion of the problem of public trust and expert knowledge justifying the demand for specific ethical training for engineers; core competency needed to analyze and use professional standards and professional and disciplinary ways of self-governance oriented toward decision-making

**CSM:** Discussion of the types of oral communication engineers are expected to perform professionally and the audiences for those types.

Reading Assigned: Zarefsky: ch. 3 (Audience)

**Analyzing the Ethics of Technology: Avoiding technological determinism through Core-System-Society Models**

**VSR:** Presentation of an analytical method for ethical reasoning and decision-making.

**CSM:** Preparation for basic principles of informative modes of speaking.

Reading: Hughes, “Large Technological Systems”

Applying the Core-System-Society Model

VSR: Working through a case study using the C-S-S model to examine how specific values do and ought to inform decision-making, practices and policies.

Reading: Pfatteicher, Lessons Amid the Rubble, ch. 1, Zarefsky, ch. 5 (Research)

**HOMEWORK #1 due.**

**SECTION II: ETHICAL THEORIES**

**Philosophical Approaches to Ethics: Consequentialism**

**VSR:** Presentation, using examples, of a method for ethical analysis.

**CSM:** Preparation for identifying controversy in complex issues and preparing reasoned arguments about these disputes.

Reading: Rogers, “The End Use Problem in Engineering Ethics”, Zarefsky, ch 6 (Reasoning)

**Philosophical Approaches to Ethics: Deontology**

**VSR:** Presentation, using examples, of a method for ethical analysis.

**CSM:** Preparation for identifying controversy in complex issues and preparing reasoned arguments about these disputes.

Reading: Gewirth, “Professional Ethics”

**Philosophical Approaches: Virtues**

**VSR:** Presentation, using examples, of a method for ethical analysis.

**CSM:** Preparation for identifying controversy in complex issues and preparing reasoned arguments about these disputes.

Reading: Schmidt, “Engineering Ethics as Virtue Ethics”

**Philosophical Approaches: Pragmatism**
VSR: Presentation, using examples, of a method for ethical analysis.
CSM: Preparation for identifying controversy in complex issues and preparing reasoned arguments about these disputes.
Reading: Pfatteicher, ch. 2, Zarefsky, ch. 2 (Listening)

HOMEWORK #2 DUE

SECTION III: PUBLIC SPEAKING

The problem of expertise and earning the public trust
VSR: Preparation for understanding social practices related to responsibility, accountability, and justice coupled with reasons why engineers ought to hold specific norms and values regarding their social responsibility.
CSM: Presentation of critical approaches to the identification of audiences and principles of listening and understanding audiences’ constraints in order to engage responsibly with diverse audiences.
Reading: Zarefsky, ch.11 (presenting)

Planning Public Speaking
CSM: Considerations of how to develop a rhetorical approach and strategy for a variety of different audiences
Reading: Zarefsky, ch. 4.4-4.6 (Developing a Strategic Plan), 13 (Informing)

Modes of ethical reasoning for public communication
VSR: Summary of the ethical theories, frameworks and approaches presented in the first four weeks; types of ethical arguments
CSM: Application of these modes of reasoning to public speaking.
Reading: Zarefsky, ch. 10 (Styles), Pfatteicher, ch. 3

SECTION IV: REASONING AND PRESENTING CASE STUDIES

Whistle-Blowing and Loyalty
VSR: Consideration of the reasons why individuals should hold certain values and how these values should inform decision making.
CSM: Identification of controversy in complex issues and effective methods of informing, persuading, and exchanging views.
Reading: Hyatt Case Study Materials

HOMEWORK #3 DUE.

Discussion Section: Hyatt Walkway Collapse
Reading: Zarefsky ch. 15.3 (Persuading), Pfatteicher, ch. 4.

Risk and Risk Assessment
VSR: Consideration of a method for ethical analysis, reasoning, and decision-making.
CSM: Identifying and explaining informative speaking about risk-oriented technological controversies.
Reading: Challenger Case Study Materials
Discussion Section: Challenger Explosion
Reading: Zarefsky, ch. 10 (Style)

Risk and Risk Perception
VSR: Consideration of a method for ethical analysis, reasoning, and decision-making and the reasons individuals with different values and epistemic frameworks might disagree with it.
CSM: Discussion of communication focused on audiences’ constraints, listening, and modes of persuasive speech aimed at groups who may not share the values of the speaker regarding controversial topics involving the different perception of risk.
Reading: Three Mile Island Case study Materials

Discussion Section: Three Island Island
Reading: Zarefsky, ch. 11 (Presenting)

Product Use and Misuse
VSR: Consideration of values, norms, beliefs that guide technological practices.
CSM: Preparation for work in identifying, explaining, and applying principles of informative speaking.
Reading: Antilock Braking Systems Case Study Materials

Discussion Section: Antilock Braking Systems
Reading: Zarefsky, ch. 14 (Persuading)

Liability, Persuasive speech about responsibility
VSR: Consideration of the way societies cope with failure and controversy.
CSM: Preparation for work in identifying, explaining, and applying principles of argumentative speaking.
Reading: Ford Explorer Rollover Case Study Materials

Discussion Section: Ford Explorer Rollover
Reading: Zarefsky, ch. 7,8 (Organizing the Speech)

Tort Litigation
VSR: Consideration of the legal definitions of responsibility
CSM: Principles of argumentative speaking and reasoning in the courtroom
Reading: Love Canal Case Study Materials

Discussion Section: Love Canal
Reading: Zarefsky, ch. 3 (Audience)

Regulation, Revisiting Question of Audience
VSR: Preparation for considering the implications of following or filing to follow values/norms/ideals.
CSM: Identification of controversy in complex issues and the construction of argumentative and informative strategies with regard to the controversies.
Reading: Therac-25 Case Study Materials

Discussion Section: Therac-25
Reading: Zarefsky, ch. 11.5 (Practicing Presentations)

Governance
VSR: Preparation for considering the implications of following or failing to follow values/norms/ideals.
CSM: Identification of controversy in complex issues and the construction of argumentative and informative strategies with regard to the controversies.
Reading: Fuel Cell Technology Case Study Materials
HOMEWORK #4 DUE.

Discussion Section: Fuel Cell Technology
Reading: Zarefsky, ch. 6.8-9 (Reasoning)

Corporate Responsibility
VSR: Preparation for consideration of the way specific values/norms/ideals ought to inform decision-making and policies.
CSM: Discussion about corporate audiences and their obligations.
Reading: BP Macondo Well Explosion and Oil Spill Case Study Materials

Discussion Section: BP Macondo Well Explosion and Oil Spill
Reading: Pfatteicher, ch. 5

Environmental Ethics
VSR: Presentation, using examples, of methods for ethical analysis concerning the environment.
CSM: Preparation for identifying controversy in complex issues and preparing reasoned arguments about these disputes.
Reading: Hoover Dam Case Study Materials

Discussion Section: Hoover Dam
Reading: Pfatteicher, ch. 6
PAPER DUE.

Environmental Ethics (con’t): Antropo-, Bio-, and Eco-Centrist Accounts,
Reading: Typhoon Guchol and Fukushima Daiichi Radiation Leak Case Study Materials

Discussion Section: Typhoon Guchol and Fukushima Daiichi Radiation Leak
Globalization
VSR: How specific values ought to inform decision making, practices and policies concerning engineering in the developing world.
CSM: Questions of listening and speaking to internationally diverse audiences.
Reading: World Trade Center Case Study Materials

Discussion Section: World Trade Center

Appropriate Technologies
VSR: How local values should inform the choices about technologies, focusing on the developing and poor world
CSM: Listening and Speaking to diverse audiences
Reading: Arsenic Contamination in Bangladesh Case Study Materials

Discussion Section: Arsenic Contamination in Bangladesh
Reading: Zarefsky, ch. 12 (Visual Aids)

Visual Display of Information as a persuasive technique: Revisiting the Challenger decision
VSR: A discussion of the way presentation techniques contributed to the disastrous decision to launch the Challenger in 1986
CSM: How visual aids support reasoning and public presentations.

Final Speech rehearsals, including audience commentary
Preparing the course’s final assignment of a public presentation and a poster.

Final Project, presented during final exam period(s): Each student present an ethical case using a poster as a visual aid, as would be standard practice in a conference session. Students will be expected to provide a speech of approximately ten minutes that addresses the societal, political, economic, and ethical implications of a significant controversy related to a contemporary engineering and/or technological decision/project. NB – Because more than one section of PHIL 325 is taught each term, there will be multiple instructors assessing the presentations simultaneously (as in a conference poster session). This will allow the approximately 20 presentations to be performed and assessed in the 150 minute exam period.