Online Ethics Center
FOR ENGINEERING AND SCIENCE

Ethical Issues in Engineering Seminar

Author(s)

Robert E. McGinn

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Description

The description and syllabus of a class on ethical issues in engineering.

Body

I. Course Description and Purpose

E 131/STS 115 is a seminar devoted to the study of ethical issues in contemporary engineering practice. The purpose of the course is threefold: to expose students to ethical issues of the sorts that engineers sometimes face in professional practice, to help students think more clearly and deeply about such issues, and to explore resources, strategies, and options for grappling with such conflicts. Topics covered will include moral obligations and rights of engineers in relation to society, employers, colleagues, and clients; cost-benefit-risk analysis, safety, and informed consent; the ethics of whistle-blowing; ethical conflicts of engineers as expert witnesses and managers; ethical issues in engineering design, manufacturing, and operations; ethical issues arising from engineering work in foreign countries; and ethical implications of the social and environmental contexts of contemporary engineering. The course will make extensive use of case studies of ethical issues

drawn from different fields of engineering. If necessary, the size of the class will be limited to maintain the character of a seminar.

Note Well: E 131/STS 115 satisfies Area 8 of the old Stanford University Distribution Requirement system, the Social Sciences component (3B) of the new Stanford General Education Requirements (GERs), and the School of Engineering's "Technology in Society Requirement."

II. Course Requirements

1. Completion of assigned readings;
2. Participation in class discussion;
3. Participation in the design, administration, and analysis of a survey on ethical issues in engineering; and
4. Presentation and write-up of a real-life case study of an ethical issue in engineering based on original research by student duos.

III. Grading

1. Class discussion: 25%
2. Survey and related short in-class presentation: 25%
3. Case Study: 50% (30% for the in-class presentation; 20% for the written report)

IV. Required Readings

1. Deborah G. Johnson, ed., *Ethical Issues in Engineering* (Prentice Hall, 1991).
2. Robert E. McGinn, ed., *STS 115/E 131 Course Reader* (Stanford Bookstore, 1997).

Note Well: in what follows, a designation such as "(DJ4)" follows the title of some assigned articles. In such cases what is meant is that the article in question is the fourth of the 32 numbered articles in the anthology edited by Deborah Johnson. Articles without any such designation after their titles will be found in the course reader.

V. Calendar of Topics and Reading Assignments

I. Introduction

- Why study ethical issues in engineering? What makes an issue in engineering "an ethical issue"? Introduction to class survey of engineering students and practitioners on ethical issues in engineering

T 4/01 Introduction to Course

II. Foundational Materials

- T. Reynolds, "The Engineer in Nineteenth-Century America," in T. Reynolds, ed., *The Engineer in America* (Chicago: U. of Chicago Press, 1991), 7-26
- T. Reynolds, "The Engineer in Twentieth-Century America," in T. Reynolds, ed., *The Engineer in America* (Chicago: U. of Chicago Press, 1991), 169-190
- E. Layton, "The Engineer and Business" (DJ4)
- E. Greenwood, "Attributes of A Profession" (DJ6)

- National Society of Professional Engineers (NSPE), Code of Ethics for Engineers (1990)
- American Society of Civil Engineers (ASCE), Code of Ethics (1993)
- Association for Computing Machinery (ACM), Code of Ethics (1993)
- Hans Lenk, "An Honor Code for Technical Intelligence?", *Vdi Nachtrichten*, Number 20, 5/18/1990, 26.
- Stephen Unger, "Codes of Engineering Ethics" (DJ 11)
- Heinz Luegenbiehl, "Codes of Ethics and the Moral Education of Engineers" (DJ13)

- Michael McFarland, "The Public Health, Safety, and Welfare: An Analysis of the Social Responsibilities of Engineers (DJ 14)
- Richard DeGeorge, "Ethical Responsibilities of Engineers in Large Corporations: The Pinto Case" (D15)
- Kenneth Alpern, "Moral Responsibility for Engineers" (DJ16)

- Mike Martin and Roland Schinzinger, "Engineering as Social Experimentation" (DJ 17)

- S. Beder, "Making Engineering Design Sustainable," unpublished ms.
- A. Ansari, "The Greening of Engineers: A Cross-Cultural Experience," unpublished ms.
- J. Anderson, "Ethics and the Expert Witness," Institute of Transportation Engineers, 122-124
- J. Bachner, "Facing Down the Hired Gun," *Journal of Performance of Constructed Facilities*, Vol. 2, No. 4, 1988, 190-198
- T. Broome, "Engineering Responsibility for Hazardous Technologies," *Journal of Professional Issues in Engineering*, Vol. 113, No. 2, April 1987, 139-149
- R. Schinzinger and M. Martin, "Shared Responsibility for New Technologies: Engineers and their Corporations," *IEEE Spectrum*, April 1990, 13-17
- R. McCuen, "Ethical Issues in Risk Assessment," *Issues in Engineering--Journal of Professional Activities*, Vol. 107, No. E12, April 1981, 93-104

Th 4/03 The Engineering Profession in the U.S. in Historical Perspective
T 4/08 Codes of Engineering Ethics
Th 4/10 Moral and Social Responsibilities of Engineers I
T 4/15 Moral and Social Responsibilities of Engineers II (Note Well: Turn in Tabulated Y/N/NOp Survey Responses at Class)
Th 4/17 Analysis and Discussion of Survey Findings and Individual Student Questions

aggregated answers to questions common to all questionnaires
short commentaries on responses to individual questions (see notes at end of survey form)

III. Case Studies of Ethical Issues in Engineering

- T. Hughes, "Technological Momentum in History: Hydrogenation in Germany, 1898-1933," *Past and Present*, Number 44, 106-132
- G. Fleming, "Engineers of Death," NYT, July 18, 1993, Sec. 4, 19
- B. Jakobsen, "Ethics and the American Society of Civil Engineers," privately printed pamphlet, Los Angeles, California, April 1955, 1-13

- L. Graham, "Palchinsky's Travels," *Technology Review*, November/December 1993, 23-31.

- The DC-10 Cargo Door Latch (design)
- F. Sawyier, "The Case of the DC-10," unpublished ms.
- The B.F. Goodrich A7D brake system (design and testing)
- K. Vandivier, "'Why Should My Conscience Bother Me?'" in R. Heilbroner, ed., *In the Name of Profit* (NY: Doubleday, 1972), 3-31

- Selection of Duos for Original Case Study Presentations on 5/29 and 6/3 The Citicorp Building
- Joseph Morgenstern, "The Fifty-Nine Story Crisis," *Journal of Professional Issues in Engineering Teaching and Practice*, January 1997, 23-29.

Th 5/01 Contemporary Case Studies IV

- Ethics and the Engineering Consultant:
- John Doe, "The Case of the Composite Material Bicycle"
- Robert McGinn, "Optimization, Option Disclosure, and Problem Redefinition: Derivative Moral Obligations of Engineers and the Case of the Composite Bicycle," *Professional Ethics*

- T. Bell and K. Esch, "The Fatal Flaw in Flight 51L," *IEEE Spectrum*, February 1987, 36-51
- R. Boisjoly, "Ethical Decisions: Morton Thiokol and the Space Shuttle Challenger Disaster," ASME, WA

GM truck (testing)

- G. Stix, "Bhopal: A Tragedy in Waiting," *IEEE Spectrum*, June 1989, 47-50
- S. Diamond, "The Bhopal Disaster: How It Happened," *New York Times*, January 28, 1985, A1, A6, A7
- S. Diamond, "The Disaster In Bhopal: The Workers Recall Horror," *New York Times*, January 30, 1985, A1 and A6
- Robert Reinhold, "Disaster in Bhopal: Where Does the Blame Lie?" *New York Times*, January 31, 1985, A1 and A8
- S. Diamond, "The Disaster in Bhopal: Lessons for the Future," *New York Times*, February 3, 1985, A1 and A8

- Ibrahim, Youssef, "Successors Ready, U.S. Oilmen Bow Out of the Saudi Empire," *New York Times*, April 1, 1989

- H. Petroski, "Accidents Waiting To Happen," from Henry Petroski, *To Err is Human*(New York: Vintage, 1992), 85-97
- H. Petroski, "The Kansas City Tragedy: There Is Not Always Strength in Numbers," *Technology Review*, August/September 1982, 29-30
- R. Rubin, L. Banick, and C. Thornton, "The Hyatt Decision: Two Opinions," *Civil Engineering*, September 1986, 69-72
- Kim Roddis, "Structural Failures and Engineering Ethics," *Journal of Structural Engineering*, Vol. 119, No. 5, May 1993, 1539-1555.

T 5/20 Contemporary Cases X, Westside Highway Project (construction; environmental impact statement)

- Beder, Sharon, "Environmental Impact Statements: the Ethical Dilemma for Engineers," unpublished ms.
- Sierra Club et al. v. U.S. Army Corps of Engineers et al., U.S. District Court, S.D. New York, August 7, 1985 (614 F. Supp. 1475 D.C.N.Y. 1985)
- Background article by R. McGinn and packet of materials on Westway Project.

T 4/22 Four Historical Case Studies
Th 4/24 Contemporary Case Studies I & II
T 4/29 Contemporary Case Studies III
T 5/06 Contemporary Cases Studies V, Space Shuttle (development): film
Th 5/08 Contemporary Case Studies VI & VII

- B. Meier, "Courtroom Drama Pits G.M. Against a Former Engineer," *New York Times*, January 19, 1993, D1 and D16
- P. Applebome, "G.M. Is Held Liable Over Fuel Tanks In Pickup Trucks," *New York Times*, February 5, 1993, A1 and A16
- B. Meier, "$105 Million Liability Award Against G.M. Is Struck Down," NTY, 6/14/94, A8

Ford Pinto (design and testing)

- W. Shaw, "Ford's Pinto," from William H. Shaw, *Business Ethics*, (Belmont, CA: Wadsworth, 1991), 75-77

- M. Hoffman, "The Ford Pinto," in W. Michael Hoffman and Jennifer Moore eds., *Business Ethics*, (New York: McGraw-Hill: 1984), 412-420

T 5/13 Contemporary Case Studies VIII, The Bhopal Disaster (design, operation, technology transfer)

Th 5/15 Contemporary Cases IX, Hyatt Hotel in K.C. (construction)

IV. Organizational Perspectives

Th 5/22 Ethical Issues Faced By Engineers in Organizations

- V. Gunther, Plaintiff, v. IBM et al. Defendants, Superior Court of California, City of Los Angeles, Case SC027054, November 12, 1993 (complaint)
- R. Ho, "Ethics and High-Tech Engineering: Unique Ethical Issues of the Silicon Valley Workplace," unpublished ms.
- T. Perry, "Cleaning Up," *IEEE Spectrum*, February 1993, 20-26
- J. Rauch, "The Law on Reverse Engineering," *IEEE Spectrum*, August 1993, 47-48
- M. Baram, "Trade Secrets: What Price Loyalty?" (DJ/23)
- R. Frederick and M. Snoeyenbos, "Trade Secrets, Patents, and Morality" (DJ/24)
- R. McGinn, "The Engineer's Moral Right to Reputational Fairness," *Science and Engineering Ethics*, Vol. 1, No. 3, 1995, 217-230.

V. Resources for "Solutions"

- L. Winner, "Engineering Ethics and Political Imagination" (DJ32)
- E. Ferguson, "The Gap Between Promise and Performance," from his *Engineering and the Mind's Eye* (Cambridge, Mass.: MIT Press, 1992), 169-194
- R. Chalk, "Making the World Safe for Whistle-Blowers," *Technology Review*, January 1988, 48-57
- "False Claims," U.S. Code, Title 31, Money and Finance, Section 3729, 508-513
- S. Ungar, "Would Helping Ethical Professionals Get Professional Societies Into Trouble?" (DJ31)

T 5/27 Prevention, Mitigation, Recourse

VI. Student Case Study Reports

Th 5/29 Student Case Study Reports I
T 6/03 Student Case Study Reports II
Th 6/05 Conclusion (and Case Studies not given 5/29 or 6/03)

FINAL EXAM PERIOD

June 6-11

VI. The In-Class Presentations

On Thursday May 29 and Tuesday June 3, seminar members, working in pairs, will make in-class presentations. Each two-person presentation, lasting 16 minutes, must take the form of an original case study of an incident or episode involving an ethical issue or conflict in contemporary engineering practice. The case study may be based on one or more kinds of research, e.g., unearthing and analysis of courtroom records or in-person or telephonic interviews with engineer participants and others involved in the situation under scrutiny. To secure cooperation of reluctant participants, feel free to offer to preserve confidentiality to your interviewee. Regardless of the kind of study undertaken, the presentation must include the following:

1. appropriate general background information;
2. description of the socio-technical situation in the case in sufficient detail to enable the listener/reader to appreciate the situation that faced the engineer(s) in question;
3. identification and characterization of the ethical issue or conflict in question;
4. elaboration and probing analysis of the issue or conflict (e.g., of its genesis, trajectory and outcome; evaluation of the strengths and weaknesses of the arguments made on both sides; etc.); and
5. delineation of noteworthy morals or lessons about ethical issues in engineering extracted from the case presented.

Each duo must also submit a written report of roughly 1250 words describing the case studied and specifying the resources used in putting together the presentation. Please attach any tapes, articles, transcripts, or other documents that you have gathered or generated in your research.

Notes

Author: *Prof. Robert McGinn; Office: Bldg. 370, Rm. 110; mcginn@leland; Tel 5-0117.*

Rights

Resource Type

Instructor Materials

Parent Collection

Syllabi

Topics

Ethical Decision-Making
Workplace Ethics
Safety
Whistleblowing
Social Responsibility

Discipline(s)

Teaching Ethics in STEM
Engineering

Publisher

Stanford University