Spring 2021

PHIL 334-102: Engineering Ethics

Peter Heap

Engineering Ethics and Technological Practice: Philosophical Perspectives on Engineering

SYLLABUS

Course Information

Course: Engineering Ethics and Technological Practice: Philosophical Perspectives on Engineering

Number/section: PHIL 334 – 102

Semester: Spring 2021

Time: Thursday, 6 p.m. to 8:50 p.m.

Location: Kupfrian 104 and converged learning

Instructor: Peter Heap

Email: pah5@njit.edu

Office hours: I am available before or after class. Email me to set an appointment.

Prerequisites: HUM 102 with a grade of C or higher, and one History and Humanities GER 200 level course with a grade of C or higher.

Learning Objectives

At the end of this course, students will be able to:

- Show how ethical and philosophical questions are an integral part of engineering
- Understand the ethical duties of engineers in the practice of their profession
- Apply the major ethical theories to the analysis of problems in engineering
- Recognize the different ethical and philosophical roles of engineers
- Explain how engineered products shape the lives of the people who use them and have political consequences

Description

Ethics is an integral part of the practice of engineering. Many, if not all, engineering tasks have an ethical component and incorporate a philosophical outlook. Although some engineering problems have a stronger ethical flavor while others are more weighted to the technical side, there is no clear dividing line between what is an ethical question and what is an engineering question. To engineer without ethics and without a philosophical understanding is to engineer badly.

This purpose of this class is to help students engineer better by giving them an understanding of how ethics and philosophy are an inseparable component of engineering. To do this, we will look at ethical and philosophical theories and see how they make the problems of engineering clearer.

The course will emphasize case studies of particular examples in engineering. Rather than dictating viewpoints to students, it aims to equip them with the tools and abilities to think through engineering problems from an ethical and philosophical perspective.

Books

You will need to buy the following books:

- Mike W. Martin and Roland Schinzinger, *Ethics in Engineering*, fourth edition, McGraw-Hill, 2005. ISBN 978-0-07-283115-3.
- Langdon Winner, *The Whale and The Reactor*, University of Chicago Press, 1989. ISBN 978-0-226-90211-0.

Other readings will be available via URLs, from the NJIT library website or by email.

Grading

Grading will be as follows:

- Class participation and attendance: 14%
- Engineering as experimentation homework: 4%
- Forms of life homework: 4%
- Forms of life case study: 10%
- First ethics case study: 10%
- Final ethics case study: 12%
- Mid-term exam: 12%
- Final exam: 34%

Class participation and attendance

Discussion is an important part of improving our understanding, clarifying our ideas and discovering different points of view. It also helps develop the valuable skill of being able to explain and defend a point of view. Debate will be encouraged in this course. The grade is 1% per week for every week except the final exam week, divided between attendance and participation. Total: 14% of grade.

Homework

There are two short homeworks. In the first you will analyze the Teton Dam case using the model of engineering as experimentation. The second will ask you to analyze the telephone as a form of life. Total: 4% each for a total of 8% of grade.

Forms of life case study

To better understand the impact of technology, for this case study you will go without a specific technology for a day. You will then report on your experience and analyze it using the perspective of forms of life. Total: 10% of grade.

First ethics case study

The second case study will have two parts. Identification of a case and sources (minus 1% from grade if not done), and description and analysis using theories discussed in class. Total: 10% of grade.

Final ethics case study

The third case study will have two parts. Identification of a case and sources (minus 1% from grade if not done), and description and analysis using theories discussed in class. Total: 12% of grade.

Mid-term exam

The mid-term exam will be made up of four short essay questions worth 3% per question. You will have a choice of questions. The exam will be open book. Total: 12% of grade.

Final exam

The final exam will be made up of four short essay questions worth 3% per question, six multiple-choice questions worth 1% each and two longer essay questions worth 8% per question. You will have a choice of questions. The exam will cover the entire semester and will be open book. Total: 34% of grade.

Grades

The maximum grade for the class is 100%. Letter grades will be assigned as follows:

90 to 100:	A	70 to 74:	C
85 to 89:	B+	60 to 69:	D
80 to 84:	B	59 and less:	F
75 to 79:	C+		

Deadlines

Work is due on the dates shown in the class schedule. Numerical grades for late submissions will be multiplied by 0.95 for up to 48 hours late, 0.9 for up to a week late, 0.8 for up to two weeks late, 0.7 for up to three weeks late and 0.6 for up to four weeks late. No work will be accepted later than four weeks after the due date or after the start of final exams.

Plagiarism and Academic Integrity

Plagiarism or copying of any kind will not be tolerated. All work must be your own. Specifically, it must be your own thoughts and your own ideas expressed in your own words. Any use of other's efforts must be credited via a citation. NJIT's policy is as follows:

Academic integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students' office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will be subject to disciplinary action. This may include a failing grade of F and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu

Class Schedule

January 21

Introduction: Plan of the course, introduction to ethics and to ethics in engineering

January 28

Models of engineering: Engineering as commitment, engineers as professionals, engineering as responsibility

Professional ideals and business demands: Engineers' two roles, the purpose of a corporation, the Revolt of the Engineers

Ethical theories: Deontological ethics, utilitarianism, virtue ethics and more

Mike W. Martin and Roland Schinzinger, "Ethics and Professionalism," in *Ethics in Engineering*, 1-31.

February 4

Case studies: Northern States Power, San Diego water purification

Two more models of engineering: Engineering as experimentation, engineering as pragmatic participation

Case studies: Samsung Galaxy Note 7, the electricity grid

Mike W. Martin and Roland Schinzinger, "Engineering as Social Experimentation," in *Ethics in Engineering*, sections 4.1 and 4.2, 88-106

Anna Shedletsky, "Aggressive Design Caused Samsung Galaxy Note 7 battery explosions," Instrumental, Inc., Dec. 1, 2016. https://instrumental.com/resources/failure-analysis/aggressive-design-caused-samsung-galaxy-note-7-battery-explosions/

Olive Heffernan, "Bottoms Up," *Scientific American*, July 2014, 69-75. (Available from NJIT library website via JSTOR.)

Peter Fairley, "Building a Weather-Smart Grid," *Scientific American*, July 2018, 60-65. https://www.researchgate.net/publication/325891548_Building_a_Weather-Smart_Grid

Homework due February 11:

Case study: Teton Dam

Philip M. Boffey, "Teton Dam Verdict: A Foul-up by the Engineers," *Science*, Vol. 195, No. 4275, Jan. 21, 1977, 270-272 (Available from NJIT library website)

These pictures show what happened:

Wikipedia, "Teton Dam," https://en.wikipedia.org/wiki/Teton_Dam#Collapse_and_flood

February 11

Case study: Challenger disaster

Forms of life, political technology

Case study: Cellphones, social media

Mike W. Martin and Roland Schinzinger, "Challenger," in *Ethics in Engineering*, 106-116.

Langdon Winner, "Technologies as Forms of Life," "Do Artifacts Have Politics?" in *The Whale and the Reactor*, 3-39.

- Teton Dam homework due

Homework due February 18:

Forms of life: The telephone

Ithiel de Sola Pool, *Forecasting the Telephone: A Retrospective Technology Assessment*, Ablex, 1983, 41-45 (Will be distributed).

February 18

Perceptions, safety, risk: How technology changes perceptions, how we perceive technology, risks versus hazards

Case studies: Flight 965, Chernobyl and Three Mile Island

John Edward Huth, "Losing Our Way in the World," *New York Times*, July 21, 2013. https://www.nytimes.com/2013/07/21/opinion/sunday/losing-our-way-in-the-world.html

Stephen Manes, "When Trust in 'Data' is Misplaced," *New York Times*, Sept. 17, 1996. https://www.nytimes.com/1996/09/17/science/when-trust-in-data-is-misplaced.html

Federal Aviation Administration, American Airlines Flight 965 near Cali: Accident Overview. https://lessonslearned.faa.gov/ll_main.cfm?TabID=1&LLID=43&LLTypeID=2

Mike W. Martin and Roland Schinzinger, "Commitment to Safety," in *Ethics in Engineering*, 117-145.

Langdon Winner, "On Not Hitting the Tar-Baby," in *The Whale and the Reactor*, 138-154.

- Forms of life homework due

February 25

Moral reasoning: A five-step process

Case study: The Ford Pinto

Mike W. Martin and Roland Schinzinger, "Resolving Ethical Dilemmas" in *Ethics in Engineering*, 32-39

Mark Dowie, "Pinto Madness," *Mother Jones*, September/October 1977. http://www.motherjones.com/politics/1977/09/pinto-madness

March 4

Review for mid-term exam

Cost-benefit analysis and utilitarianism: Working for a tobacco company, criticisms and responses

Steven Kelman, "Cost-Benefit Analysis: An Ethical Critique," *The American*, Feb. 7, 1981. https://www.aei.org/articles/cost-benefit-analysis-an-ethical-critique/

James V. DeLong, Robert M. Solow, Gerard Butters, John E. Calfee, Pauline Ippolito and Robert A. Nisbet, "Defending Cost-Benefit Analysis: Replies to Steven Kelman," *The American*, April 11, 1981. https://www.aei.org/articles/defending-cost-benefit-analysis-replies-to-steven-kelman/

- Forms of life case study due

March 11

Midterm exam

Technological revolutions

Langdon Winner, "Mythinformation," in *The Whale and the Reactor*, 98-117 (If you are short of time: 106-115).

Optional: Langdon Winner, "Building the Better Mousetrap" and "The Whale and the Reactor," in *The Whale and the Reactor*, 61-84, 164-178 (These chapters will be discussed briefly but you are not expected to read them).

Nolen Gertz, *Death by Robot*, ABC, July 12, 2016. http://www.abc.net.au/religion/articles/2016/07/12/4499213.htm

Atlas, the Next Generation. https://youtu.be/rVlhMGQgDkY

Otto and Budweiser: *First Shipment by Self-Driving Truck*. https://www.youtube.com/watch?v=Qb0Kzb3haK8

March 18

Spring break: no class

March 25

Whistleblowing: The ethical dilemma, when is it permissible, when is it required?

Dennis A. Gioia, "Pinto Fires and Personal Ethics: A Script Analysis of Missed Opportunities," *Journal of Business Ethics*, 1992, Vol. 11 (5), 379-389. (To be distributed)

Mike W. Martin and Roland Schinzinger, "Whistleblowing," in *Ethics in Engineering*, 172-184.

Jerry Useem, "What Was Volkswagen Thinking?" *The Atlantic*, January/February 2016, 26-28. (Available from NJIT library website)

- First ethics case study: Identify a case

April 1

Codes of ethics

Ethical relativism: Are ethical values the same everywhere and for everyone?

International business and offshoring

Case study: Bhopal

Case study: Tesla

Mike W. Martin and Roland Schinzinger, "Codes of Ethics," in *Ethics in Engineering*, 44-53.

Mike W. Martin and Roland Schinzinger, "Multinational Corporations," in *Ethics in Engineering*, Sections 9.1.2, 9.1.3, 9.1.4 and 9.1.5, 245-252.

Cherri Pancake, "Programmers need ethics when designing the technologies that influence people's lives," *The Conversation*, Aug. 8, 2019. https://theconversation.com/programmers-need-ethics-when-designing-the-technologies-that-influence-peoples-lives-100802

Matt Richtel, "Tesla's Chief Sticks to Mission Despite Setbacks," *New York Times*, July 24, 2016. http://nyti.ms/2akqWaY

Eric A. Taub, "Can Tesla's Autopilot be Trusted? Not Always," *New York Times*, Sept. 23, 2016. http://nyti.ms/2d6WthQ

Neil E. Boudette, "Big Carmakers Merge, Cautiously, Into the Self-Driving Lane," *New York Times*, Sept. 1, 2016. http://nyti.ms/2c4RwWz

Robert Yaeger, "When Cars do the Driving, Who Will Feel The Joy?" *New York Times*, June 14, 2018. https://nyti.ms/2l8SVy1

April 8

Autonomous systems

Paul Scharre, "Autonomous Weapons and Operational Risk," *Center for a New American Security*, 1-40, (41-54 is optional). https://www.cnas.org/publications/reports/autonomous-weapons-and-operational-risk

Arend Hintze, "What an Artificial Intelligence Researcher Fears about AI," *The Conversation*, July 13, 2017. https://theconversation.com/what-an-artificial-intelligence-researcher-fears-about-ai-78655

Christopher Salge, "Asimov's Laws Won't Stop Robots Harming Humans So We've Developed a Better Solution," *The Conversation*, July 10, 2017. https://theconversation.com/asimovs-laws-wont-stop-robots-harming-humans-so-weve-developed-a-better-solution-80569

- First ethics case study: Analysis due

April 15

Engineering and the environment: Attitudes to nature, the Invisible Hand, the Tragedy of the Commons, externalities, theories of environmental responsibility

Case study: Southern Co.'s clean coal project

Langdon Winner, "The State of Nature Revisited" in *The Whale and the Reactor*, 121-137

Mike W. Martin and Roland Schinzinger, "Environmental Ethics," in *Ethics in Engineering*, 219-241.

Ian Urbina, "Piles of Dirty Secrets Behind a Model 'Clean Coal' Project," *New York Times*, July 5, 2016. https://www.nytimes.com/2016/07/05/science/kemper-coal-mississippi.html

- Final ethics case study: Identify a case

April 22

Professionalism, responsibility, honesty

Mike W. Martin and Roland Schinzinger, "Workplace Responsibilities and Rights" and "Honesty," in *Ethics in Engineering*, sections 6.1 to 6.3, 146-172, chapter 7, 189-218.

- Final ethics case study: Analysis due

April 29

Review for final exam

Weapons: Just war theory, examples

Personal fulfillment, personal values

Mike W. Martin and Roland Schinzinger, "Weapons Development," in *Ethics in Engineering*, 266-271.

Mike W. Martin and Roland Schinzinger, Self-Realization and Self-Interest," in *Ethics in Engineering*, 72-84

May 6

Reading day: no class

May 13

Final exam