

San José State University
Department of Electrical Engineering
EE 295, Electrical Engineering, Section 01, Fall, 2009

Instructor:	Gene Moriarty
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Office Hours:	M 11:45-to 12:45 and TR 17:30 to 19:30
Class Days/Time:	MW 10:30-11:45
Classroom:	ENGR 340
Prerequisites:	Graduate standing in EE

Course Description

The engineer as person, engineering as process, and the engineered as product. The nature of engineer, engineering, and engineered. The ethics of engineer, engineering, and engineered, namely Virtue Ethics, Process Ethics and Material Ethics. Focal engineering and its relation to modern and pre-modern engineering.

Course Goals and Student Learning Objectives

This seminar examines the engineering project and its three major elements of engineer, engineering, and engineered. Starting with the modern engineering enterprise, a stress is placed on the process and the character of that process. The seminar then turns to an extensive discussion of Process Ethics. Next, there is a look at colonization of the human lifeworld by the engineering enterprise and the contextualization of the engineering enterprise by decisions made within the lifeworld. Then the course takes a backward look at the premodern engineering endeavor and the character of the engineer becomes the focus. A comparison of premodern and modern engineers is presented. Then the course considers Virtue Ethics as appropriate to the person of the engineer. In the third and final part of the course, attention is directed at the products of the focal or postmodern engineering venture. The ethics appropriate to it, called Material Ethics, is investigated with the idea of securing a good life in a human-made world, the attainment of which requires the balancing of many polarizing forces.

Course Content Learning Outcomes

Upon successful completion of this course, students will be able to:

LO1 Analyze and comprehend the three elements of the engineering project (engineer, engineering, engineered) and see how they comprehensively integrate under the umbrella of that project. (h)

LO2 Interpret the engineering project globally and historically. (j), (h)

LO3 Analyze and assess the ethics of the engineering process. (f), (g), and (d)

LO4 Analyze and assess the ethics of the engineer. (f), (g), and (d)

LO5 Analyze and assess the ethics of engineered products. (f), (g), and (d)

LO6 Describe and interpret the key elements of ethical issues emerging from a consideration of case studies, and report on findings individually and in groups, orally and in writing. (d), (f), (g), (h), and (j).

ABET outcomes

The letters in parentheses in the course learning objectives refer to ABET criterion 3 outcomes satisfied by the course. These are listed below as a reference:

- (a) An ability to apply knowledge of mathematics, science, and engineering
- (b) An ability to design and conduct experiments, as well as to analyze and interpret data
- (c) An ability to design a system, component, or process to meet desired needs
- (d) An ability to function on multi-disciplinary teams
- (e) An ability to identify, formulate, and solve engineering problems
- (f) An understanding of professional and ethical responsibility
- (g) An ability to communicate effectively
- (h) The broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) A recognition of the need for, and an ability to engage in life-long learning
- (j) A knowledge of contemporary issues
- (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
- (l) Specialization in one or more technical specialties that meet the needs of companies
- (m) Knowledge of probability and statistics, including applications to electrical engineering
- (n) Knowledge of advanced mathematics, including differential and integral equations, linear algebra, complex variables, and discrete mathematics
- (o) Basic sciences, computer science, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components

Required Texts/Readings

Textbook

Gene Moriarty, *The Engineering Project: Its Nature, Ethics, and Promise*, (Penn State University Press), 2008. (EP)

Other Readings

Other readings and essays about contemporary issues relevant to this class will be available on the Internet or from the course website at <http://www.engr.sjsu.edu/gmoriart/teaching.htm> .

Classroom Protocol

Students are expected to participate actively in class. Students will turn their cell phones off or put them on vibrate mode while in class. They will not answer their phones in class.

Dropping and Adding

Students are responsible for understanding the policies and procedures about add/drops, academic renewal, etc. [Information on add/drops are available at http://info.sjsu.edu/web-dbggen/narr/soc-fall/rec-298.html](http://info.sjsu.edu/web-dbggen/narr/soc-fall/rec-298.html). [Information about late drop is available at http://www.sjsu.edu/sac/advising/latedrops/policy/](http://www.sjsu.edu/sac/advising/latedrops/policy/). Students should be aware of the current deadlines and penalties for adding and dropping classes.

Assignments and Grading Policy

Evaluation Criteria:

	Percentage
Class Participation -----	10
In-class writing, group exercises, homework assignments and responses --	30
Three Research Exercises (individual, not group, effort) -----	30
Midterm Exam -----	10
Final Exam -----	<u>20</u>
	Total 100

Concerning the Three Research Exercises and other information:

You must individually complete three Research Exercises as a major segment of this course. From the first week in the course we will discuss the three kinds of ethics (process ethics, virtue ethics, and material ethics) which the course will investigate and which will constitute the foundational material for your Research Exercises. As a part of your reports you should incorporate both a historical perspective and a cultural perspective on the issue which your case study investigates. Analysis from the points of view of all three types of ethics and also from the point of view of the IEEE Code of Ethics will be essential. The Research Exercise reports must be at least 5 pages, approximately 1300 words each, double-spaced and 12 point type. At least three credible references in each exercise must be employed from texts or referred journals. (Other in-class and take-home writing assignments in the course will bring the number of words up to approximately 9000.)

- Almost every week we will have
 - 1) an in-class writing exercise (½ page, 125 words x 14 weeks=1750 words),

- 2) an in-class group exercise (forming into small groups of 3-5 students, discuss a handout from the literature and have the group's spokesperson report to the class, with each student having the opportunity to report at least once during the semester),
- 3) a take-home writing exercise (1 page, 250 words x 13 weeks=3250 words).

Feedback regarding form and content will be provided on all the writing assignments in an on-going fashion. Along with class participation, these weekly exercises will constitute 40% of your grade.

<u>Assignment</u>	<u>Topics</u>	<u>Learning Objectives</u>
1	Process	LO1, LO2, LO6
2	Process Ethics	LO3, LO6
3	Colonization	LO2, LO6
4	Person	LO1, LO2, LO6
5	Virtue Ethics	LO4, LO6
6	Contextualization	LO2, LO6
7	Product	LO1, LO2, LO6
8	Material Ethics	LO5, LO6
9	Balance	LO1, LO2, LO6

Grading Percentage Breakdown

90% and above	A
80% - 90%	A-
70% - 80%	B+
60% - 70%	B
below 60%	F

Weekly Course Schedule

Week 1 – Introduction and Overview

Goals: to introduce myself and have you do the same / to discuss the course Green-Sheet / to introduce some basic ideas about ethics from two short videos by Lawrence Hinman / to introduce fundamental ideas concerning engineering ethics via a Power Point Presentation called “Engineering Ethics in 3-D” / to learn about the micro and macro perspectives on the engineering project and the three types of ethics to be considered in this class / to discuss case studies in engineering ethics / to have a half-page in-class written response to course material.

Readings due: none.

Assignments (due next week): read EP Introduction / read the essays “Obama and the Return of the Real,” Jonathan Schell, *The Nation*, 2009 and “Three Kinds of Ethics for Three Kinds of Engineering,” Moriarty, Gene, *IEEE Technology and Society Magazine*, 2001 / write (type) a one-pager indicating steps you as an engineer might take to mitigate the crises Jonathan Schell points out.

Week 2 – Case Study Analysis

Goals: to further discuss the contextualized view of the engineering project and three types of ethics we are emphasizing in this course / to further discuss the “Ethics Engine” / to

present another case study and have you write a ½ page in-class response indicating where the ethical issues lie in this case study / to have an in-class group exercise.

Readings (due this week): EP Introduction, the Schell essay and the Moriarty essay.

Assignments (due next week): EP Chapter 1 (Process) / read the essay “Engineering Ethics and Political Imagination,” Winner, Langdon, Broad and Narrow Interpretations of Philosophy of Technology, P. T. Durbin (ed.), 1990 / write a one-page critique of what Winner has to say about the use of Case Studies in engineering ethics classes.

Week 3 – The Processes of the Engineering Project

Goals: to discuss and critique Winner’s position on engineering ethics / to discuss the fundamental constituents of the process of the modern engineering enterprise: engineering science, engineering design, and engineering professionalism / to have an in-class group exercise / to have a half-page in-class written response to course material.

Readings (due this week): EP Chapter 1 and the Winner essay.

Assignments (due next week): EP Chapter 2 (Process Ethics) / read “Ethical Considerations in Engineering Design Processes,” van Gorp and van de Poel, *IEEE Technology and Society Magazine*, 2001 / **Research Exercise #1** will be assigned for which details will be provided (due in 4 weeks).

Week 4 – Engineering Professionalism and Process Ethics

Goals: to understand and discuss the fundamental elements of a profession and how engineering can be taken as a profession / to appreciate the need for a profession to embrace a sense of obligation and thereby be guided by a system of ethics / to have an in-class group exercise / to have a half-page in-class written response to course material.

Readings (due this week): EP Chapter 2 and the van Gorp and van de Poel essay.

Assignments (due next week): read the essay “Professional Ethics, Ethos, and the Integrity of the Professions,” Sullivan, William M., *The Centennial Review* / “The Public Health, Safety and Welfare,” McFarland, Michael, *IEEE Technology and Society Magazine*, 1986 / write a one page essay discussing whether or not protection of the health, safety, and welfare of the public is a sufficient value for engineers to pursue in order to be true professionals.

Week 5 – Process Ethics and Engineering Codes

Goals: to understand the succinct IEEE Code / to show how this code can be applied to case studies / to present a case study video (*Incident at Morales*) in dramatized form and have you analyze the ethical issues involved and write a ½ page in-class response to these issues (one question to answer is at what point in the video did ethics issues first arise?) / to have an in-class group exercise.

Readings (due this week): the essay by Sullivan and the essay by McFarland.

Assignments (due next class): read the essay “Rules, Ethics and Morals in Engineering Education,” Vesilind, P. Aarne, *Engineering Education* and “Three Myths about Codes of Engineering Ethics,” Davis, Michael, *IEEE Technology and Society Magazine*, 2001 / write a one page explanation about why engineers need codes of ethics.

Week 6 – Further Discussion of Process Ethics

Goals: to understand fundamental ethical theories like deontology and consequentialism / to show how these theories are embedded in codes of ethics / to appreciate the need to embrace the health, safety, and welfare of society as paramount / to understand how the three values of health and safety, environmental sustainability, and social justice emerge from engineering codes as primal values which engineering practice ought to pursue / to

have an in-class group exercise / to write a half-page in-class response to course material.

Readings (due this week): the Vesilind essay and the Davis essay.

Assignments (due next week): read the essays “Technology, Sustainability, and Development,” Jurgensen, Arnd, *Bulletin of STS*, 2000 and “Engineering Ethics: The Conversation without End,” Florman, Samuel, *NAE Bridge*, 2002 / no writing home work because the RE#1 is due next week.

Week 7 – Further Discussion of Process Ethics

Goals: to understand how the value of health & safety operates within the process ethics framework / to understand how the value of environmental sustainability operates within the process ethics framework / to understand how the value of social justice operates within the process ethics framework / to have an in-class group exercise / to write a half-page in-class response to course material / **RE#1 is due.**

Readings (due this week): the Jurgensen essay and the Florman essay.

Assignment (due next week): EP Chapters 3 (Colonization) and 6 (Contextualization) / read the essay “Notes on Habermas” as well as the short book review “What Else Is New?” Shapin, Steven, *The New Yorker*, 2007 (hand-out) / write one page explaining your understanding of the difference between Technological Determinism and Social Constructionism.

Week 8 – The Shift from a Micro View to a Macro View

Goals: to understand the Technological Determinism vs. Social Constructionism debate / to understand the contextualization and colonization distinction / to discuss the shift from process to person / to have an in-class group exercise / to write a half-page in-class response to course material / MIDTREM EXAM / **Research Exercise #2** will be assigned for which details will be provided (due in 3 weeks).

Readings (due this week): EP Chapters 3 and 6 / the Habermas essay and the Shapin review.

Assignments (due next week): EP Chapter 4 (Person) / read the essay “The Technological Personality,” Stivers, Richard, *Bulletin of Science, Technology, and Society*, 2004 / write a one page critique of the Stivers essay in terms of ideas from the EP Chapter 4,

Week 9 – The Person of the Engineer and Ethics Video

Goals: to understand who the engineer is, her or his personality and character / view an ethics case study video and analyze it in terms of what we know so far / a comparison of the pre-modern engineer of the past, the modern engineer of the present, and the focal engineer of the future / to have an in-class group exercise.

Readings (due this week): EP Chapter 4 / the Stivers essay.

Assignments (due next week): EP Chapter 5 (Virtue Ethics) / read the essay (at the website) “Platonic Virtue Theory and Business Ethics,” Klein, Sherwin, *Business & Professional Ethics Journal*, 1989 / write one page comparing Klein’s view on virtue ethics and the view in Chapter 5 of EP.

Week 10 – Virtue Ethics

Goals: to understand virtue ethics of the person / to understand the structures of being-toward, being-with, and being-for grounding the virtues of objectivity, honesty, and care / to have an in-class group exercise applying the tenets of virtue ethics to electrical engineering related case studies / to write a half-page in-class response to a video case study.

Readings (due this week): EP Chapter 5 and the Klein essay.

Assignments (due next week): EP Chapter 7 (Product) / read the essay “A Different Voice by Carol Gilligan” / no writing home work because the RE#2 is due next week.

Week 11 – Products of the Engineering Process

Goals: to hand in the 2nd Research Exercise / to understand what the products of the engineering process are and how these products can be Focal Products / to inquire about these systems, services, structures, devices, organisms, and networks which are being let loose upon the planet: are they good products? Do they fulfill and engage our lives in a deep and meaningful manner? / to have an in-class group exercise / to write a half-page in-class response to course material.

Readings (due this week): EP Chapter 7 and the Gilligan essay.

Assignments (due next week): EP Chapter 8 (Material Ethics) / read the essay (at the website) “Reversal of Fortune,” McKibben, Bill, *Mother Jones*, 2007 / write one page showing how material ethics can make a difference in your life.

Week 12 – Material Ethics

Goals: to understand how the goal of The Good, which focal products strive for, invokes a wider context and that includes political and spiritual dimensions / case studies on the cell phone and RFID devices / to understand material ethics of the product / to understand the different kinds of harmony: engagement, enlivenment, and resonance / to be able to relate these to the product, the world, and the end-user / to have an in-class group exercise / to write a half-page in-class response to course material / **Research Exercise #3** will be assigned for which details will be provided (due in 3 weeks).

Readings (due this week): EP Chapter 8 and the McKibben essay.

Assignments (due next week): read the essays “The Good Life in a Technological World: Focal Things and Practices in the West and in Japan,” Heikkero, Topi, *Technology in Society*, 2005 / and Borgmann, Albert, “The Moral Significance of Material Culture,” in his collection of essays *Power Failure*, 2006 (hand-out) / write a one page response to Heikkero’s essay.

Week 13 – Further Discussion of Material Ethics

Goals: to understand how engineers can satisfy the tenets of virtue ethics and engineering can satisfy the tenets of process ethics but the engineered product can still be ethically problematic / to deepen our understanding of the material ethics of the product via examples / to understand how it can be used to assess the ethicality of engineered products / to elaborate on the Ethics Engine as a quasi-mathematical methodology aimed at providing a point of departure for the assessment of person, process, and product / to have an in-class group exercise / to write a half-page in-class response to course material.

Readings (due this week): Heikkero essay and Borgmann essay.

Assignments (due next week): EP Chapter 9 (Balance) / read the essay “Amish Technology,” Wetmore, Jameson, *IEEE Technology and Society Magazine*, 2007 and write a one pager about how Amish practices and products are focal.

Week 14 – Balance

Goals: to understand the balance that we seek in focally engineered products / to have an in-class writing on course material / to have an in-class group exercise.

Readings (due this week): EP Chapter 9 and the Amish essay.

Assignment (due next week): re-read EP Chapter 9 (Balance) and write a one page critique invoking your own sense of what might constitute a balance in your own life with

regard to how ethics plays a role in the activities of your day to day life.

Week 15 – Balance

Goals: to compare the Quality of Life with the Standard of Living / to consider the distinction between wealth and affluence / in-class group assignment / in-class writing exercise.

Readings (due this week): EP Chapter 9 (Balance).

Assignment (due next week): prepare for final exam and finish RE#3.

Week 16 – Final Research Exercise #3 due

Goals: peer review of RE#3 / review for the final exam.

Final exam will be SATURDAY 12/12: 1000-1215 in E189 the Engineering Auditorium

University Policies

Academic integrity

Students should know that the University's [Academic Integrity Policy is available at http://www.sa.sjsu.edu/download/judicial_affairs/Academic_Integrity_Policy_S07-2.pdf](http://www.sa.sjsu.edu/download/judicial_affairs/Academic_Integrity_Policy_S07-2.pdf).

Your own commitment to learning, as evidenced by your enrollment at San Jose State University and the University's integrity policy, require you to be honest in all your academic course work. Faculty members are required to report all infractions to the office of Student Conduct and Ethical Development. The website for [Student Conduct and Ethical Development is available at http://www.sa.sjsu.edu/judicial_affairs/index.html](http://www.sa.sjsu.edu/judicial_affairs/index.html).

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism (presenting the work of another as your own, or the use of another person's ideas without giving proper credit) will result in a failing grade and sanctions by the University. For this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include in your assignment any material you have submitted, or plan to submit for another class, please note that SJSU's Academic Policy F06-1 requires approval of instructors.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 requires that students with disabilities requesting accommodations must register with the DRC (Disability Resource Center) to establish a record of their disability.

University Based Ethics Resources on the WEB

Web Resources: See the following web sites for more materials on engineering ethics and professionalism:

1. The Online Ethics Center for Engineering and Science: <http://onlineethics.org/>
2. National Institute for Engineering Ethics: <http://www.niee.org/>
3. Center for the Study of Ethics in the Professions at IIT: <http://ethics.iit.edu/>
4. Association for Practical and Professional Ethics at IU:
<http://www.indiana.edu/~appe/>
5. IEEE Ethics and Member Conduct Committee:

- <http://www.ieee.org/organizations/committee/emcc/>
6. IEEE Society on Social Implications of Technology:
<http://policy.rutgers.edu/andrews/projects/ssit/ungercom.shtml>
 7. Texas A&M Univ. engineering ethics: <http://ethics.tamu.edu/>
 8. NSF Workshops, Teaching Ethics and Computing, K. Bowyer, Univ. Notre Dame:
<http://www.cse.nd.edu/~kwb/nsf-ufe/index.html>
 9. NSPE Board of Ethical Review: <http://www.nspe.org/ethics/eh1-whb.asp>
 10. Ethics Officer Association: <http://www.eoa.org/>
 11. Journal, "Science and Engineering Ethics": <http://www.opragen.co.uk/SEE/>
 12. The WEB cite for Computer Ethics at <http://ethics.csc.ncsu.edu/>