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# Capstone Design

## Engineering Ethics

# Engineering Ethics (Wikipedia)

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- Engineering ethics is the field that examines and sets standards for an Engineers' obligations to:
  - the public,
  - their clients,
  - employers,
  - and the profession.
- In the US, Engineers provide independent consulting to clients (*usually* licensed Professional Engineers)
- Engineers working in industry are governed by various laws including “whistleblowing” and product liability laws

# Engineering Ethics

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- Engineering does not have a single uniform system of ethical conduct across the entire profession
- National Society of Professional Engineers (NSPE)
- Other professional societies
  - IEEE
  - ASME
  - ASCE
  - AiChE

# Code of Ethics (IEEE)

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- To accept **responsibility** in making **engineering decisions** consistent with the **safety, health and welfare** of the public, and to **disclose promptly** factors that might **endanger** the public or the environment;
- To **avoid real or perceived conflicts of interest** whenever possible, and to disclose them to affected parties when they do exist;
- To be **honest** and realistic in **stating claims** or estimates based on available data;
- To **reject bribery** in all its forms;
- To **improve the understanding of technology**, its appropriate application, and potential consequences;

## Codes of Ethics (IEEE -- continued)

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- To maintain and **improve our technical competence** and to **undertake technological tasks** for others **only if qualified** by training or experience, or after full disclosure of pertinent limitations;
- To seek, accept, and **offer honest criticism of technical work**, to acknowledge and correct errors, and to **credit properly the contributions** of others;
- To **treat fairly** all persons regardless of such factors as race, religion, gender, disability, age, or national origin;
- To **avoid injuring others**, their property, reputation, or employment by false or malicious action;
- To **assist colleagues** and co-workers in their **professional development** and to support them in following this code of ethics.

# Ethical Issues

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- Quality
- Safety
- Ensuring legal compliance
- Conflict of interest
  - Bribery
  - Relationships with clients, consultants, competitors, and contractors
  - Gifts, meals, services, and entertainment
- Treatment of confidential or proprietary information
- Outside employment/activities

# Ethics dispute

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- Many ethics related disputes are caused by attempts to satisfy irreconcilable constraints
  - For example, suppose it is impossible to test a product adequately in time to meet a delivery date
  - Missing the delivery date constitutes a highly visible failure, with clearly defined penalties
  - There may be no obvious indication that an important set of tests has been omitted, even if this leads to a substantial increase in the probability of a life threatening system failure
- Under such conditions, there is a temptation to meet the deadline by skipping or shortening the tests

# Guidelines for Engineers Dissenting on Ethical Grounds ([www.onlineethics.org](http://www.onlineethics.org))

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## Guidelines (*IEEE Ethics Committee 11/11/96*)

- **Establish a clear technical foundation**
- **Keep your arguments professional**
- **Try to catch problems early and work with the lowest managerial level possible**
- **Make sure that the issue is sufficiently important**
- **Use organizational dispute resolution mechanisms**
- **Keep records and collect paper**
- **Resigning**
- **Use Outside Resources**



# Whistleblowing

([www.onlineethics.org](http://www.onlineethics.org))

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- A basic ethical dilemma exists when an Engineer takes a concern to their organization and the concern is not satisfactorily addressed.
  - A whistle-blower is a person who takes a concern **outside the organization** in which the abuse is occurring and with which the whistle blower is affiliated.
  - Regulatory agencies exist to perform oversight and to which whistle-blowers can go **anonymously**. Going to those charged with oversight is usually seen as much less adversarial than, say, going to the media.

# FE Exam Sample Problem

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1. What is the direct result of ethical behavior?
  - A. Your reputation will be enhanced.
  - B. You will be rewarded economically.
  - C. You will feel good about yourself.
  - D. Neither I, II, or III

**Answer is D**

Ethical behavior promises nothing, not even a “warm fuzzy” feeling for having done “what is right.”

# FE Exam Sample Problem

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2. Complete the sentence: “if you check the calculations for a licensed (registered) friend who has gone into a consulting business for himself/herself,
- A. “you should be paid for your work.”
  - B. “your friend’s client should be told of your involvement.”
  - C. “you do not need to be licensed or registered yourself.”
  - D. “your friend assumes all the liability for your work.”

## **Answer is B**

Whether you are paid or not is between you and your friend. Both of you need to be licensed and both of you can be held liable for the work. The client has a right to know who worked on the design.

# FE Exam Sample Problem

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3. What does it mean when a design professional accepts a punishment for an unethical act from his technical society “with prejudice?”
- A. The professional’s race, creed, and national origin were considered in deciding on the punishment.
  - B. The professional’s race, creed, and national origin were not considered in deciding on the punishment.
  - C. Even after the sentence is served or punishment is completed, there may be further actions taken.
  - D. The professional is held in bad report for the period of prejudice.

**Answer is C**

“With prejudice” means there may still be further ramifications. For example, a professional whose membership is revoked may need to have a future hearing in order to rejoin the society.

# FE Exam Sample Problem

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4. While supervising a construction project in a developing country, an Engineer discovers that his client's project manager is treating laborers in an unsafe and inhumane manner (but for that country, legal). When he protests, the Engineer is told by the company executives that the company has no choice if it wishes to remain competitive in the regions, and he should accept this as the way things are. What would Ethics require the Engineer to do?
- A. Take no action – the company is acting in a perfectly legal manner.
  - B. Withdraw from the project, returning any fees he may have already received.
  - C. Report the company to the proper authorities for its human rights abuses.
  - D. Assist the laborers in organizing a strike to obtain better working conditions.

**Answer is B**

The company hasn't broken any laws, so there is no one to report them to, but it is using unethical business practices. The Engineer should at least withdraw from the project as a form of protest. He could go so far as to assist the workers in a strike, but this might actually be illegal in the country and such activism would be a personal choice, not something he is obligated to do under a code of ethics.

# FE Exam Sample Problem

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5. Two engineers submitted sealed bids to a prospective client for a design project. The client told Engineer A how much Engineer B had bid and invited Engineer A to beat that amount. Engineer A really wants the project and honestly believes he can do a better job than Engineer B. What should he do?
- A. He should submit another quote, but only if he can perform the work adequately at the reduced price.
  - B. He should withdraw from consideration for the project.
  - C. He should remain in consideration for the project, but not change his bid.
  - D. He should bargain with the client for the cost of the work.

## **Answer is C**

It would be unethical for Engineer A to submit another bid and may even be illegal depending on the regulatory agency. He does not, however, have to remove himself from consideration.

# FE Exam Sample Problem

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6. You are a city Engineer in charge of receiving bids on behalf of the city council. A contractor's bid arrives with two tickets to a professional football game. The bid is the lowest received. What should you do?
- A. Return the tickets and accept the bid.
  - B. Return the tickets and reject the bid.
  - C. Discard the tickets and accept the bid.
  - D. Discard the tickets and reject the bid.

**Answer is A**

Registrants should not accept gifts from parties expecting special consideration, so the tickets cannot be kept. Inasmuch as the motive of the contractor is not known with certainty, in the absence of other bidding rules, the bid may be accepted.

# Ethics Summary

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- Engineering is a profession, not just a job.
- Study of Engineering Ethics can guide us in resolving the moral dilemmas we might encounter.
- Being **responsible** is the cornerstone of Ethics.
- Ethical Solutions require that we strike a balance between our responsibilities to our:
  - Profession
  - Employer
  - Client
  - Society
  - Ourselves



# Some Notable Examples of Engineering Failures With Ethical Issues

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- Mississippi River Bridge (2007)
- Failure of Levees in New Orleans (2005)
- Space Shuttle Columbia disaster (2003)
- Space Shuttle Challenger disaster (1986)
- Chernobyl disaster (1986)
- Bhopal disaster (1984)
- Kansas City Hyatt Regency walkway collapse (1981)
- Three Mile Island accident (1979)
- Ford Pinto safety problems (1970s)
- Titanic (1912)

# Ethics Report Due 2/3/2010

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Each group will choose an engineering case study that involves ethical issues and write a report that includes the following information.

\*Note: Report should not exceed 5 pages (double spaced). Include all appropriate references in your report (does not count toward total length).

- 1) A brief description of the event (give facts, statistics, dates, etc.)
- 2) Identify the ethical issues involved.
- 3) Include discussion of what codes of ethical conduct were applicable to the case and why.
- 4) Where there any consequences to any engineers involved in the case.
- 5) Summarize important positions taken by all involved parties including individuals, companies, government offices, general public, if applicable.
- 6) If dissenting engineering positions are involved, describe these giving the basis for the dissent, documenting the process that dissenters used throughout the case, and summarizing the resulting impact (positive or negative) on the engineers, companies, or government entities involved.

# Teaming exercise Due 2/3/2010

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Each member of the group will report on how the division of labor was addressed for the group Ethics report. Refer to group roles described in the teaming lecture (on web site, end of the Design lecture) and simply describe the method your group used to produce the group report.

So... On Feb 3, your group will turn in 1 Ethics report and each member of the group will turn in the teaming exercise.