Engineering Ethics

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Course Structure

- 1st Hour:
  - Ethical Thought
  - Modes of Ethical Reasoning
  - Ethical Lessons in Fable and Literature
  - Ethical and Legal Behavior

Ethical Thought

- Ethics -
  - General ethics: principles governing activities between people in personal and professional lives.
  - Professional ethics: principles governing activities between professionals and their clients, customers, and the public.
  - Engineering specific: principles governing activities related to approval of plans, designs, and requisite qualifications (or engineers)

Modes of Ethical Reasoning

- Theories of Ethical Thought
  - Value Ethics
  - Utility Ethics
  - Duty Ethics

Moral Theory

- A moral theory defines terms in uniform ways and links ideas and problems together in consistent ways.
- Scientific theory organizes ideas, defines terms,facilitates problem solving.
- Both attempt to provide a logical framework for decision making.

Value Ethics

- Ethics based on the moral concept of “virtue.”
  - Focused on the “character” of the individual.
  - Correct behavior (virtue) are actions that lead to or stem from “good” character traits.
  - Incorrect behavior (vice) are actions that lead to or stem from “bad” character traits.
- Society defines “virtue” and “vice”
- All cultures from the most “primitive” to the most “advanced” have uniformly common concepts of “good” and “bad” character.

Utility Ethics

- Ethics based on the moral concept of what is good for society.
  - Actions that maximize well being of society.
  - Utility, usefulness, benefit are all fundamental ideas in this mode of ethical reasoning.
  - Benefit or well being of the individual is subservient to well being of society.

Utility Ethics

- Radioactive materials
  - Benefits society by improving health care, making electricity, etc.
  - Generates waste materials
- Increased risk to individuals living near disposal facilities, transport routes, etc. is far outweighed by benefit to society.
- Disposal of waste at a central facility (WIPP, Yucca Mountain) makes sense and is ethical according to utilitarian theory.

Utility Ethics

- Depends on knowing what will lead to the most good.
- Determining benefit involves guesswork.
- Consequences matter
  - Sometimes cannot predict outcomes.
  - Involves quantification of risk.
- Despite these objections it is a valuable tool for decision making.

Utility Ethics

- Act utilitarianism (John Stuart Mill 1806-1873) focused on actions.
  - Individual actions should be judged based on whether the most good was produced, and rules should be broken if doing so will lead to the most good.
  - Begs definition of "good."
  - "End justifies the means." (Machiavelli)
  - "The needs of the many outweigh the needs of a few" (Star Trek)

Utility Ethics

- Act utilitarianism (John Stuart Mill 1806-1873) focused on actions.
  - Common rules of morality (don't steal, don't harm others, be honest, etc.) are consistent with this concept and are guidelines developed from centuries of human experience.
  - Sometimes these common rules must be violated to achieve common benefit. (e.g. it might be justifiable to steal food to prevent starvation)

Utility Ethics

- Rule utilitarianism focused on compliance.
  - Common rules of morality (don't steal, don't harm others, be honest, etc.) are developed and tested from centuries of human experience.
  - Sacrifice in certain situations to uphold rules ultimately leads to the most good.
  - Creates dilemma:
    - "An unjust rule applied uniformly is fair"
    - "All pigs are equal, some pigs are more equal than others"

Utility Ethics

- Benefit-cost analysis
  - Fundamentally it is an application of utilitarianism.
  - Costs usually straightforward to predict.
  - Benefits require guess work.
    - Some benefits are not economically quantifiable.
    - Often only policy (politics) can assign benefit in these situations.
  - Are those who benefit the same as those who bear the costs?
    - Taxation and public infrastructure.

Duty Ethics

- Duties: Ethical behavior is a set of fundamental duties for which all citizens are responsible (Immanuel Kant 1724-1804).
- Rights: Individuals have certain rights that are to be respected (John Locke, 1632-1704) by others.
  - Life, liberty, property, etc.
- Duty Ethics: Ethical behavior is a duty, and our duty is to uphold certain individual and collective rights.

Duty Ethics

- Duty ethics is poor at resolving certain kinds of "greater good" issues.
- Individual property rights are often condemned to make way to collective property use.
  - Violates certain precepts of duty ethics
  - Consistent with utilitarian ethics.

Modes of Ethical Reasoning

- Value
  - Individual character.
- Utilitarian
  - Collective "good"
- Duty
  - Duty to behave ethically
  - Consistent with individual rights and good character
  - Character implies that collective "good" will be served even if certain individual rights are sacrificed.

Ethical Dilemmas

- Morally "blameless" if the person intends to to good, but consequences turn out bad.
- Intentions are irrelevant, only outcomes matter.
  - Good intentions are not enough
  - Not excuse for bad behavior

Ethical Dilemmas

- Corporate morality.
  - A corporation is not a person, hence it cannot be a moral agent.
  - Corporations are comprised of people and deal with people.
- Because of the interactions with people, corporations are expected to behave morally, even though it is unenforceable (in the legal sense).
- Requires that a choice exist.
  - Monopolies
  - Governments

Problem

A persons behavior is ethical when one:

A. Does what is best for oneself.
B. Has good intentions, no matter how things turn out.
C. Does what is best for everyone.
D. Does what is most profitable.

Problem

Which of the following ensure that behavior is ethical?

I. Following the law
II. Acting in the best interest of society.
III. Following non-legal standards for socially approved conduct.

A. All of the above.
B. II and III only.
C. None of the above.
D. I only.

Ethical Lessons in Literature

- Fables
- Searching for Summer

Ethical and Legal Behavior

- Comparison and Contrast
- Whistle Blowing
- Secrecy

Ethics and Law

- What is Legal?
- What is Ethical?
- What's the difference?
- Examples

Ethics and Law

- What is Legal?
  - Behavior and conduct and actions that are in agreement with codified (written) standards in some legal documents by some appointed legal body; those documents and legal experts determine what is law and whom should obey it.
    - Codified
    - Legal Body (Courts)
    - Documents and the Legal Body determines what is legal.
    - May not apply to all.

Ethics and Law

- What is Ethical?
  - Behavior and conduct and actions that lead to outcomes that are socially acceptable (beneficial) that to not unduly impact individual rights.
    - Defined by society.
    - Exists independently of any "experts."
    - Applies to all members of society.

Ethics and Law

- What's the difference?
  - Ethics
    - Exists independently of any "experts."
    - Is uniform in all societies.
    - Applies to all members of society.
  - Law.
    - Codified; Documents **and** the Legal Body determines what is legal. (Dependent on legal "experts").
    - Varies across the world.
    - May not apply to all.

Ethics and Law

- Examples
  - Legal requirement that a load-bearing beam must resist 5X the average predicted dead load.
    - A calculation will determine if beam is "legal"
  - Ethical standard that a beam have a safety factor sufficient to ensure ensure public safety.
    - A calculation alone is insufficient
    - The probability of failure (e.g. big loads);
    - The consequences of failure (who will be damaged);

Ethics and Law

- Examples
  - Legal to take a high-paying job.
  - If the job involves
    - Exploitation of others (slavery) - unethical.
    - Deceptive behavior - unethical

Whistle Blowing

- What?
- When?
- How?
- Consequences

Whistle Blowing

- What?
  - Act of an employee of informing the **public** or management of **unethical** or **illegal** behavior by and employer or supervisor.
  - In practice, many companies are concerned with the public disclosure and internal notification is tolerated as long as a "chain-of-command" is followed.

Whistle Blowing

- When?
  - Duty to report **illegal** behavior.
  - When internal checks fail and either safety or integrity is threatened.
- 4 “tests” that should be met:
  - Need
  - Proximity
  - Capability
  - Last resort

Whistle Blowing

- Need:
  - Clear and important harm that can be avoided.
  - Sense of proportion.

Whistle Blowing

- Proximity:
  - Must be in a clear position to report on the problem.
  - Hearsay is not adequate.
  - Firsthand knowledge and documentation are essential.
  - Must be reasonably expert in the area to assess the situation.

Whistle Blowing

- Capability:
  - Must have a reasonable chance of success.
  - Not expected to risk career or family if unable to see through to completion
- Last resort:
  - Only if no-one else is more capable.
  - Only if other means (internal communications) have/will fail.

Whistle Blowing

- Consequences:
  - Private corporation: termination is very likely; most employees are “at-will.”
  - Distrust: Even if the activity is truly wrong, you may not ever re-earn the trust of management.
  - Public employees: termination is still likely, but it would be considered retaliatory and you can sue to regain your job.

Secrecy

- Obligation to keep certain information confidential.
  - Well established principle in law and medicine.
- Why?
  - Competitive advantage (of how to engineer).
- What?
  - Test results, designs, formulas, etc.
  - Suppliers identities, production costs, employee assignments, etc.

Secrecy

- How?
  - Non-disclosure agreements.
- Consequences?
  - Civil suit (intellectual property)
- In public infrastructure many items become public and secrecy becomes irrelevant.
  - Designs to public agencies become public.
  - Costs, production methods etc.
  - Selection (of the engineer)
    - Varies; Executive committee.
    - The "ratings" are public, but the actual discussions remain secret.

Engineering Particulars

- Choices are to be based on engineering ethical standards above personal standards.

Engineering Particulars

- Example: Submitting a bid and engineer may decide to quote a higher rate of profit than is typical for such a project (personal standard - increase profit).
- If the bidding process is "open" (where others are free to submit possibly lower bids) then the pricing is an economic decision without ethical implications.

Engineering Particulars

- Example: Submitting a low bid then **secretly** substituting (possibly sub-standard) materials after initial project agreement to increase profit.
- This is a conflict between personal standards (high profit) and engineering standards (high-quality materials; adhering to specifications).
- In such a case engineering ethics are to supersede.

Engineering Legal Issues

- Transactions between engineers and their clients.
- Contract: A mutual agreement between two or more parties to engage in a transaction that benefits both.
  - Mutual consent.
  - Offer and acceptance
  - Consideration

Engineering Legal Issues

- Consideration:
  - Without evidence of benefits to each party, it is impossible to decide of each party has fulfilled their side of the agreement.
- Breach of contract
  - Actual violation of terms of the contract.
  - Remedy is to recover value of violated item.