

Engineering Ethics

Lecture 1



- ❑ Engineers are often required to engage in negotiations, hold positions of responsibility to manage other engineers, make important decisions, write reports and ensure that work is safe, minimizing risks to people and environment.
- ❑ Each of these requires an understanding of ethics, making ethical skills integral to engineering practice.
- ❑ This course aims to encourage students to think critically about the ethical implications of what engineers do.
- ❑ A secondary goal is to promote improved communication skills.



Broad Course Content

- ☐ Ethics and Professionalism
- ☐ Moral Reasoning
- ☐ Codes of Ethics
 - ☐ NSPE, IEEE, ASCE, ASME, ACM etc.
- ☐ Moral Frameworks
- ☐ Engineering Ethics for Experiments
- ☐ Commitment to Safety
- ☐ Workplace Responsibilities and Rights
- ☐ Truth and Truthfulness
- ☐ Environmental Ethics



❑ Martin, Mike & Schinzinger, Ronald, “Ethics in Engineering”, 4th ed., McGraw-Hill



What is Meant by Ethics?

- ☐ The concept of **Ethics** includes broad considerations of '**social conscience**'.
- ☐ Synonyms of Ethics –
 - ☐ Morals
 - ☐ Beliefs
 - ☐ Integrity
 - ☐ Principles
 - ☐ Conscience
 - ☐ Sense of right and wrong
- ☐ This course focuses on ***professional ethics***, not personal ethics or common morality.



THREE TYPES OF ETHICS OR MORALITY

❑ Common Morality:

Common morality is the set of moral beliefs shared by almost everyone. It is the basis, or at least the reference point, for the other two types of morality that we shall discuss. *“Prevent killing,” “Prevent deceit,” “Prevent cheating,” “Help the needy,” “Promote human happiness,” “Protect the natural environment”* etc.

The pedestrian is just as dead as if he had been murdered, but the driver's intention was not to kill him, and the law treats the driver differently, as long as he was not reckless. The result is the same, but the intent is different.

If you convey false information to another person with the intent to deceive, you are lying. If you convey the same false information because you do not know any better, you are not lying and not usually as morally culpable. Again, the result is the same (the person is misled), but the intent is different.



THREE TYPES OF ETHICS OR MORALITY

□ Personal Morality:

Personal ethics or personal morality is the set of moral beliefs that a person holds.

For most of us, our personal moral beliefs closely parallel the precepts of common morality.

We believe that murder, lying, cheating, and stealing are wrong. However, our personal moral beliefs may differ from common morality in some areas, especially where common morality seems to be unclear or in a state of change. Thus, we may oppose stem cell research, even though common morality may not be clear on the issue.



THREE TYPES OF ETHICS OR MORALITY

□ Professional Ethics

Professional ethics is the set of standards adopted by professionals insofar as they view themselves acting as professionals.

Every profession has its professional ethics: medicine, law, architecture, pharmacy, and so forth. Engineering ethics is that set of ethical standards that applies to the profession of engineering.

There are several important characteristics of professional ethics – i) usually stated in a formal code; ii) for a given profession, the focus is given on the issues that are important in that profession; iii) professional ethics is supposed to take precedence over personal morality so that it can create common professional ground;



Conflict within MORALITY

- ❑ A complication occurs when the professional's personal morality and professional ethics conflict.
- ❑ Some pharmacists in the US have objected to filling prescriptions for contraceptives for unmarried women because their moral beliefs hold that sex outside of marriage is wrong.
- ❑ Physicians who believe that abortion is wrong are not required to perform an abortion, but there is still an obligation to refer the patient to a physician who will perform the abortion.
- ❑ Suppose a client asks a civil engineer to design a project that the engineer, who has strong personal environmental commitments, believes imposes unacceptable damage to a wetland. Suppose this damage is not sufficient to be clearly covered by his engineering code.
- ❑ Sometimes the conflicts between professional ethics, personal morality, and common morality are difficult to resolve. **It is not always obvious that professional ethics should take priority,** and in some cases a professional might simply conclude that his professional ethics is simply wrong and should be changed.



What Is Engineering Ethics?

- ❑ **Engineering ethics** consists of the responsibilities and rights that ought to be endorsed by those engaged in engineering, and also of desirable ideals and personal commitments in engineering.
- ❑ In a second sense, engineering ethics is the study of the decisions, policies, and values that are morally desirable in engineering practice and research.



Why Study Engineering Ethics?

- ❑ ***Moral Awareness***: Proficiency in recognizing moral problems and issues in engineering.
- ❑ ***Cogent Moral Reasoning***: Comprehending, clarifying, and assessing arguments on opposing sides of moral issues.
- ❑ ***Moral Coherence***: Forming consistent and comprehensive viewpoints based on consideration of relevant facts.
- ❑ ***Moral Imagination***: Discerning alternative responses to moral issues and finding creative solutions for practical difficulties.
- ❑ ***Moral Communication***: Precision in the use of a common ethical language, a skill needed to express and support one's moral views adequately to others



Discussion Question

Identify the Moral Values, Issues, and Dilemmas

An engineer notified his firm that for a relatively minor cost a flashlight could be made to last several years longer by using a more reliable bulb. The firm decides that it would be in its interests not to use the new bulb, both to keep costs lower and to have the added advantage of “built-in obsolescence” so that consumers would need to purchase new flashlights more often.



Discussion Question

Therac-25

A linear electron accelerator for therapeutic use was built as a dual-mode system that could either produce X-rays or electron beams. It had been in successful use for some time, but every now and then some patients received high overdoses, resulting in painful after-effects and several deaths. One patient on a repeat visit experienced great pain, but the remotely located operator was unaware of any problem because of lack of communication between them: The intercom was broken, and the video monitor had been unplugged. There also was no way for the patient to exit the examination chamber without help from the outside, and hence the hospital was partly at fault. On cursory examination of the machine, the manufacturer insisted that the computerized and automatic control system could not possibly have malfunctioned and that no one should spread unproven and potentially libelous information about the design. It was the painstaking, day-and-night effort of the hospital's physicist that finally traced the problem to a software error introduced by the manufacturer's efforts to make the machine more user-friendly.



Discussion Question

A team of engineers are redesigning an artificial lung marketed by their company. They are working in a highly competitive market, with long hours and high stress. The engineers have little or no contact with the firm's customers, and they are focused on technical problems, not people. It occurs to the project engineer to invite recipients of artificial lungs and their families to the plant to talk about how their lives were affected by the artificial lung. The change is immediate and striking: "When families began to bring in their children who for the first time could breathe freely, relax, learn, and enjoy life because of the firm's product, it came as a revelation. The workers were energized by concrete evidence that their efforts really did improve people's lives, and the morale of the workplace was given a great lift.

- Why you think simple human contact made such a large difference
- What does it say about what motivated the engineers, both before and after the encounter?
- Is the case too unique to permit generalizations to other engineering products?



Engineering as A Profession:

- ❑ **Advanced expertise:** Professions require sophisticated skills (knowing-how) and theoretical knowledge (knowing-that) in exercising judgment that is not entirely routine or susceptible to mechanization. Preparation to engage in the work typically requires extensive *formal education*, including *technical studies* in one or more areas of systematic knowledge (humanities, sciences, arts).
- ❑ **Self-regulation:** Well-established societies of professionals are allowed by the public to play a major role in setting standards for admission to the profession, drafting codes of ethics, enforcing standards of conduct, and representing the profession before the public and the government.
- ❑ **Public good:** The occupation serves some important public good, or aspect of the public good, and it does so by making a concerted effort to maintain high ethical standards throughout the profession.



Corporate Responsibility

- ❑ **Corporate Obligations:** Corporations are communities of individuals, structured within legal frameworks; Yet corporations have internal structures consisting of policy manuals and flowcharts assigning responsibilities to individuals. When those individuals act (or should act) in accordance with their assigned responsibilities, the corporation as a unity can be said to act.
- ❑ **Corporate Accountability:** Corporations, too, have the capacity for morally responsible agency because it is intelligible to speak of the corporation as acting. The actions of the corporation are performed by individuals and subgroups within the corporation, according to how the flowchart and policy manual specify areas of authority.
- ❑ Just as individuals manifest the virtue of responsibility when they regularly meet their obligations, so too corporations manifest the virtue of responsibility when they routinely meet their obligations.

