ENGINEERING ETHICS

Engineering

- profession in which a knowledge of the mathematical and natural sciences, gained by study, experience, and practice, is applied with judgment to develop ways to utilise, economically, the materials and forces of nature for the benefit of mankind.
- profession that has a direct and vital impact on the quality of life for all people

The Engineer

- Engineers turn ideas into reality; i.e. they create useful products and systems (through design and manufacturing/construction)
- Engineers apply creativity - playing with imagination and possibilities, leading to new and meaningful connections and outcomes while interacting with ideas, people, and the environment. This is what engineers do (another possible definition of engineering) - in regard to the man-made environment.

Expectations from Engineers

- expected to exhibit the highest standards of honesty and integrity

- Services provided by engineers require honesty, impartiality, fairness and equity, and must be dedicated to the protection of the public health, safety, and welfare.

- perform under a standard of professional behaviour.

- **adherence to the highest principles of ethical conduct by engineers**.

Ethics

- A set of moral values and principles which form the standards of the code of conduct of individuals, organizations and professions.
- It is the principles of good and bad behavior governing what is right and wrong conduct.
- a body of moral principles
- a set of rules and behaviours
- standards, rules and guidelines
- socially approved conduct
- respect for people and rights
- distinguished from matters of legality

ETHICS UNIVERSAL/CONSTANT?

Ethical principles are some thing we follow regularly in our life

Some principles are universal.

Right	Wrong
Honesty	Lying
Reliability	Cheating
Mutual respect	Stealing
Nonviolence	

Ethics as Relating to Engineering

Engineering often is based on Preventative Ethics which is based on two dimensions:

1) Engineers must be able to think ahead to anticipate possible consequences of their professional actions.

2) Engineers must be able to think effectively about those consequences and decide what is the 'ethically' correct manner to handle the situation.

Standards of Proper Conduct

Common Morality

- Common morality is the set of moral beliefs shared by almost everyone.
- we usually think of such precepts as that it is wrong to murder, lie, cheat or steal, break promises, harm others physically, and so forth.

Personal Values (Ethics)

- Personal ethics or personal morality is the set of moral beliefs that a person holds.
- Our personal moral beliefs may differ from common morality in some areas.

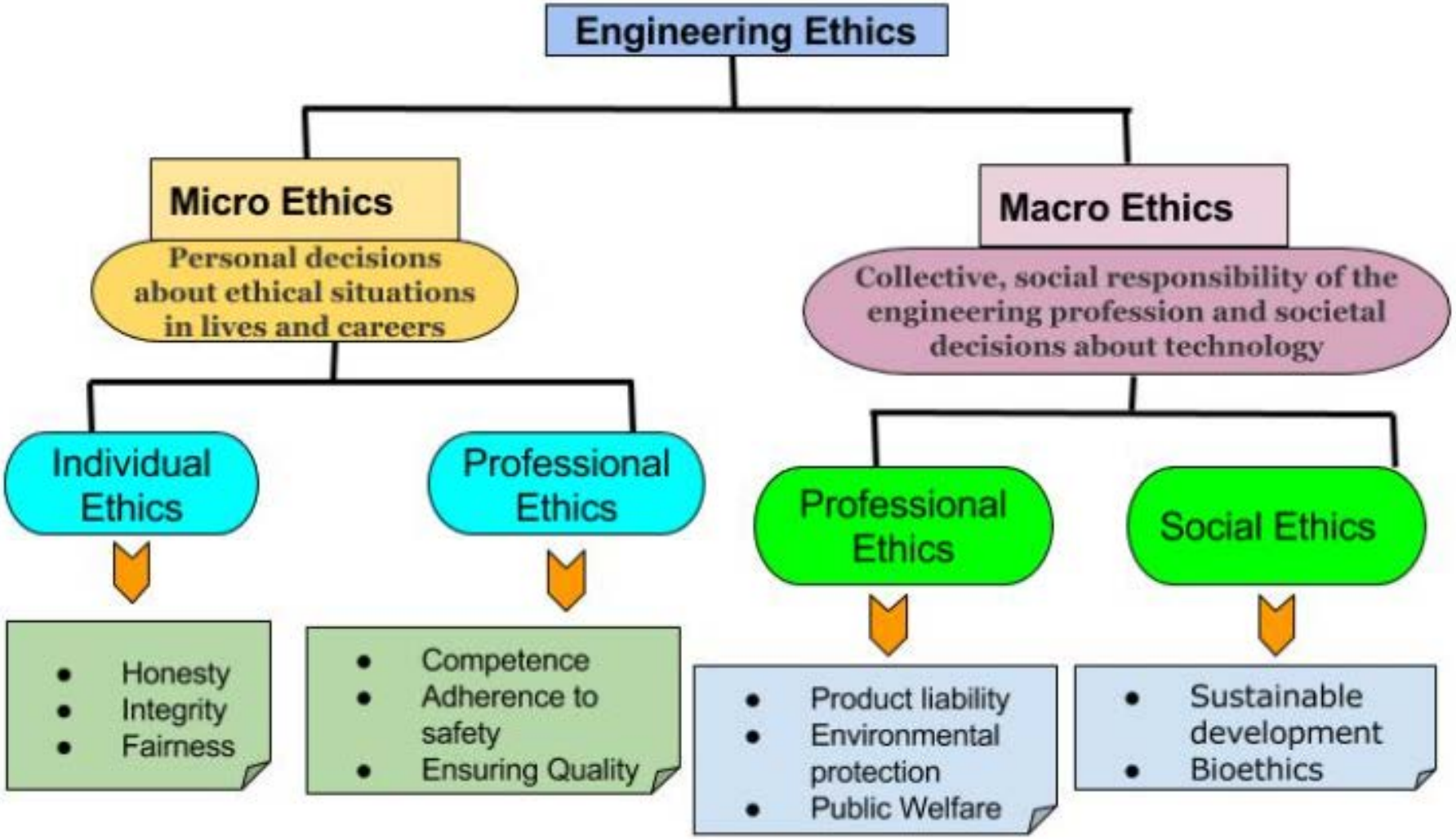
Professional Ethics

- 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.

- Professional ethics sometimes differs from personal morality in its degree of restriction of personal conduct. Sometimes professional ethics is more restrictive than personal morality, and sometimes it is less restrictive.

- Case 1: Suppose engineer Jane refuses to design military hardware because she believes war is immoral. Engineering codes do not prohibit engineers from designing military hardware, so this refusal is based on personal ethics and not on professional ethics. Here, Jane's personal ethics is more restrictive than her professional ethics.

- Case 2: Suppose civil engineer Mary refuses to participate in the design of a project that she believes will be contrary to the principles of sustainable development, which are set out in the code of the American Society of Civil Engineers. She may not personally believe these guidelines are correct, but she might (correctly) believe she is obligated to follow them in her professional work because they are stated in her code of ethics. Here, Mary's professional ethics is more restrictive than her personal ethics


Engineering Ethics
Micro Ethics
Personal decisions about ethical situations in lives and careers
Macro Ethics
Collective, social responsibility of the engineering profession and societal decisions about technology
Individual Ethics
Professional Ethics
Professional Ethics
Social Ethics
Honesty
Integrity
Fairness
Competence
Adherence to safety
Ensuring Quality
Product liability
Environmental protection
Public Welfare
Sustainable development
Bioethics

I. MICRO-ETHICAL ISSUES

- Micro-ethical issues are problems frequently faced by a person in his day-to-day functioning.
- These issues may be small but can irritate a rational person's mind and give him sleepless nights.
- In such issues, he has to decide what actions he should take and if he is prevented from taking actions that he thinks are right, then what is to be done.
- Plenty of such issues appear in professional's life.

Examples:

- A junior engineer working at construction site feels that the concreting of the roof is being done correctly.
- Too much water is being added and due to paucity of labour, the concrete mixture is not placed in position in time.
- He talks to his executive engineer about this problem.
- The executive engineer tells him to ignore this.
- He says that he has done supervision many sites and knows when to take action.
- He advises the junior engineer to ignore it and proceed.
- The junior engineer feels that this will result in a weakened structure. What should he do?

II. MACRO-ETHICAL ISSUES

- These issues deal with societal problems which are not addressed or these are neglected until they become serious.
- Macro ethical issues have great ethical implications and will benefit the society.
- Macro ethical issues are in the sphere of senior managements, a professional is not directly involved but he/she should understand the problems which cause such diffuculties.
- A professional should be concerned with such issues as these are of great importance.

Examples:

- An engineer is working in a electricity distribution company.
- He felt that the company was not doing anything about power generation problem or company did not report to the government that the power situation would aggravate in a few days.
- When the matter was discussed with his superior, he told him to keep quiet as he was concerned only with the distribution of power and not with the generation power.
- After some time, there were frequent power cuts and supply failures.
- The public started protests about the poer situation.
- Then the administration woke up and recognized the performance of the distribution companies.
- Whose fault was this?
- The power shortage situation was neglected for long and it was taken care of only when it became vert serious and some action was taken.

How Ethics Fits into Engineering

- Engineers Council for Professional Development (ECPD) states :

"**Engineers shall hold paramount the safety, health, and welfare of the public in the performance of their professional duties.**"

- Personal choices or values are irrelevant to engineering ethics

- Conflicts between personal standards and engineering ethical standards must be resolved in favor of supporting the relevant engineering ethical standards

Engineering Ethics

- The systematic study of the rules and ideals of the engineering profession

- Standards adopted by the professional community and established companies.

- Engineering ethics, where such ethics are implemented in engineering by the engineers, is necessary for the good of the society.

- Engineering Ethics is also the study of decisions, policies and values that are morally desirable in engineering practice and research.

- Engineer's duty is to uphold engineering ethics standards even if his/her job is at risk

- Good engineering ethics will be in close harmony with existing legal codes governing engineering

- Engineers have an ethical obligation to use good scientific methods at all times

- Engineering ethics codes include prohibitions on unethical behavior while off the job

As stated by Schinzinger and Martin, "Engineering ethics...is the study of the moral values, issues, and decisions involved in engineering practice" (Schinzinger and Martin,2000).

Engineering Ethics

ETHICAL BEHAVIOR	UNETHICAL BEHAVIOR
✓Quality products ✓Conservation of resources ✓Pride in work ✓Public safety ✓Timeliness ✓GOOD BUSINESS	✓Shoddy products ✓Waste, fraud, greed ✓Abuse of expertise ✓Guilt, fear ✓Lack of safety ✓Cutting corners -poor design -rushed testing ✓DISASTERS!

Dealing with: -Colleagues
-Clients
-Employees
-Public
- Environment

Typical Ethical Issues that Engineers Encounter

- Safety
- Acceptable risk
- Compliance or obedience
- Confidentiality or Privacy Policy
- Environmental health
- Data integrity
- Conflict of interest
- Honesty/Dishonesty
- Societal impact
- Fairness, etc.

Professional Responsibility

- Ethics has a second connection with engineering.
- It comes from the way in which being socially responsible puts duties and obligations on us individually.
- Ethics fits into engineering is through professional responsibility.

Two Dimensions of Ethics in Engineering

- Ethics is part of engineering for two main reasons.

a) Engineers need to be **socially responsible** when building products and processes for society.

b) Social responsibility requires **professional responsibility.**

Basic Ethical Concepts

- Ethical considerations are an integral part of making engineering decisions.
- The professional obligations of engineers go beyond fulfilling a contract with a client or customer.
- Codes of ethics can provide guidance in the decision-making process.

- Ethical obligations do not stop at any country's border; they are global.

Engineering Codes of Ethics

- not just a personal preference established and governed by the individual engineer.
- companies and professional societies have drafted codes of ethics to which their members are required to commit.
- the codes tend to be very similar.

- ❑ Accreditation Board for Engineering and Technology (ABET)
- ❑ **National Society of Professional Engineers (NSPE)**
- ❑ Institute of Electrical and Electronic Engineers (IEEE)
- ❑ American Society of Mechanical Engineers (ASME)
- ❑ **American Society of Civil Engineers (ASCE)**

* A code of ethics is not the only thing guiding our conduct as engineers, we also have laws, company or department policies, international treaties and regulations.

Code of Hammurabi

• The Code of Hammurabi is a well-preserved Babylonian code of law of ancient Mesopotamia, dated to about 1754 BC.

• If a builder has built a house for a man and has not made his work sound, and the house he has built has fallen down and so caused the death of the householder, that builder shall be put to death. If it causes the death of the householder's son, they shall put the builder's son to death…. (Babylon, 1758 B.C.)

Ethics Takes Practice: Knowledge vs. Behavior

- Unlike robots, no one can just program you to be an ethical engineer that follows the codes.

- It is possible to know the codes of ethics for engineering (or being a student), yet fail to follow them.

- Ethical behavior is about practice and virtue. It is about going beyond the codes, and practicing behavior that leads to an ethical life.

Law vs. Morality:

Examples of the Categories

Legal & Moral	Designing a system to be safe.
Legal & Immoral	Owning a slave before the pre-civil war in the US.
Illegal & Moral	Parking in a no parking zone, to come to the aid of an injured person
Illegal & Immoral	Killing an innocent person.

Ethics vs. Engineering Ethics:

Ethics	Engineering Ethics
1. Ethics is an activity which concerns with making investigations and knowing about moral values, finding solutions to moral issues and justifying moral issues and justifying moral judgments.	1. Like the ethics, engineering ethics also aims at knowing moral values related to engineering, finding accurate solutions to the moral problems in engineering and justifying moral judgments of engineering.
2. Ethics is a means of contrasting moral questions from non-moral problems.	2. Engineering Ethics gives a total view of the moral problems and how to solve these issues specifically related to engineering field.
3. Ethics is also used as a means of describing the beliefs, attitudes and habits related to an individual's or group's morality. Eg. : Ethics given in the Bhagavat Gita or the Bible or the Quran.	3. Engineering ethics is also using some currently accepted codes and standards which are to be followed by group of engineers and engineering societies.
4. As per the definition of dictionaries – 'moral principles' is about the actions and principles of conduct of the people. i.e. ethical or unethical.	4. Engineering ethics also concerns with discovering moral principles such as obligation, rights and ideals in engineering and by applying them to take a correct decision.

References

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