PROFESSIONAL ETHICS
(HUT 200)

Module III

ENGINEERING AS SOCIAL EXPERIMENTATION

Syllabus

- Engineering as Experimentation – Engineers as responsible Experimenters- Codes of Ethics- Plagiarism-A balanced outlook on law - Challenges case study- Bhopal gas tragedy.

Introduction

- The process of engineering lets you go through a series of different experiments when it comes to practical use.
- Though it is not like an experiment in laboratory under controlled conditions, which is done while learning, an engineer should be ready to do the same on a social scale involving human subjects.
- Experimentation plays an important role in the process of designing the product.

Engineering As Experimentation

- When it is decided to change a new engineering concept into its first rough design;
  - Preliminary tests or simulation should be conducted.
  - Using formal experimental methods, the materials and methods of designing are tried out.
  - These tests may be based on more detailed designs.
  - The test for designing should be evolved till the final product produced.
  - With the help of feedback of several tests, further modification can be made if necessary.
- Beyond these tests and experiments, each engineering project has to be viewed as an experiment.

Similarities to Standard Experiments

- Partial ignorance
  - Engineers don"t have all the needed facts available well in advance before starting the project.
- Uncertainties in outcome
- Continuous monitoring
- Learning from the past

Comparisons with Standard Experiments

- Experimental Control
- Humane touch
- Informed consent
  - The knowledge about the product
  - Risks and benefits of using the product and
  - All relevant information on the product, such as how to use and how not to use (do's and don'ts).
  - Knowledge and voluntariness
- Knowledge gained
  - Verify the adequacy of the design,
  - To check the stability of the design parameters, and
  - Prepare for the unexpected outcomes, in the actual field environments

ENGINEERS AS RESPONSIBLE EXPERIMENTERS

- In the process of developing a product, an engineer generally learns through experimentation.
- Responsibility is shared with the organizations, people, government, and others.
- Engineers share a greater responsibility while monitoring the projects, identifying the risks, and informing the clients and the public with facts.
- Based on this, they can take decisions to participate or protest or promote.
- A trial and error method is the mostly used method.
- An engineer should always be ready for the unexpected output.
  - Nothing is really predictable.

Responsibility of Engineers in Experimentation

- Conscientiousness (Sense of awareness)
  - Being sensitive to full range of moral values and responsibilities relevant to the prevailing situation and
  - the willingness to develop the skill and put efforts needed to reach the best balance possible among those considerations.
- Comprehensive Perspective
  - The engineer should grasp the context of his work and ensure that the work involved results in only moral ends.

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- Moral Autonomy
  - View engineering as social experimentation, and anticipate unknown consequences.
- Accountability (Moral responsibility)
  - The capacity to understand and act on moral reasons
  - Willingness to submit one's actions to moral scrutiny and be responsive to the assessment of others.

CODES OF ETHICS

- The ‘codes of ethics’ exhibit, rights, duties, and obligations of the members of a profession and a professional society.
- The codes exhibit the following essential roles:
  - Inspiration and guidance
  - Support to engineers
  - Deterrence (discourage to act immorally) and discipline (regulate to act morally).
  - Education and Mutual understanding
  - Serving and protecting the public
  - Create good public image
  - Protect the status quo
  - Promotes business interests

Advantages

- Set out the ideals and responsibilities of the profession.
- Exert a de facto regulatory effect protecting both clients and professionals.
- Improve the profile of the profession.
- Motivate and inspire practitioners
- Provide guidance.
- Raise awareness and consciousness of issues.
- Improve quality and consistency.

Limitations

- General and vague wordings
- Not applicable to all situations
- Often have internal conflicts
- Can not be treated as final moral authority for professional conduct
- Only a few enroll as members in professional society
  - Many are unaware of the codes
- Different societies have different codes
- Sometimes claimed to be threatening and forceful.

PLAGIARISM

- Stanford sees plagiarism as the "use, without giving reasonable and appropriate credit to or acknowledging the author or source, of another person's original work, whether such work is made up of code, formulas, ideas, language, research, strategies, writing or other form."
- Princeton perceives plagiarism as the "deliberate" use of "someone else's language, ideas, or other original (not common-knowledge) material without acknowledging its source."
- Oxford characterizes plagiarism as the use of "a writer's ideas or phraseology without giving due credit."
- Plagiarism can occur in many forms (writing, art, music, computer code, mathematics etc.,)
- What we call originality is actually the innovative combining, amending, or extending of material from that pool.

Avoid Plagiarism

- Always distinguish between what has been learned from others and what is being personally contributed to the reader's understanding.
- It is important to understand how to attribute words and ideas which are use to their proper source.
- Must learn how to declare intellectual debts.
- Proper attribution acknowledges those debts **responsibly, usefully, and respectfully**.

A BALANCED OUTLOOK ON LAW

- To live in harmony in the society, one should learn to maintain a balance between individual needs and collective needs of the society.
- The 'balanced outlook on law' in engineering practice stresses the necessity of laws and regulations and also their limitations in directing and controlling the engineering practice.
- Laws are needed to provide a minimum level of compliance

Examples

- Babylon's Building Code (1758 BC) set by Hammurabi, king of Babylon:
- It aimed at the builders of his time.

"If a builder has built a house for a man and has not made his work sound, and the house which he has built was fallen down and so caused the death of the householder, that builder shall be put to death. If it causes the death of the house holder's son, they shall put that builder's son to death. If it causes the death of the house holder's slave, he shall give slave to the householder.

If it destroys property, he shall replace anything it has destroyed; and because he has not made the house sound which he has built and it has fallen down, he shall rebuild the house which has fallen down from his own property. If a builder has built a house for a man and does not make his work perfect and the wall bulges, that builder shall put that wall into sound condition at his own cost".

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- The United States Steamboat Code (1852 AD):
- The steam engines used for travel during those days were really heavy and bulky with a major problem of boiler explosions.
- Alfred Guthrie, an engineer of Illinois had inspected around 200 steam boats with his own funding and found out the reasons for the boiler explosions and later prepared a report relating to the care that could be taken later.
- The recommendations were published by Senator Shields of Illinois and incorporated in senate documents which later was made a law, which made the ASME, to formulate the standards in the manufacturing of steam boats.

Proper Role of Laws

- Good laws establish minimal standards of professional conduct and provide a motivation to people.
- They serve as moral support and defence for the people who are willing to act ethically.

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- The rules which govern engineering practice should be construed as of responsible experimentation rather than rules of a game. This makes the engineer responsible for the safe conduct of the experiment.
- Precise rules and sanctions are suitable in case of ethical misconduct that involves the violation of established engineering procedures, which are aimed at the safety and the welfare of the public.
- In situations where the experimentation is large and time consuming, the rules must not try to cover all possible outcomes, and they should not compel the engineers to follow rigid courses of action.
- The regulation should be broad, but make engineers accountable for their decisions, and
- Through their professional societies, the engineers can facilitate framing the rules, amend wherever necessary, and enforce them, but without giving-in for conflicts of interest.