Engineering ethics can be understood in two primary senses: normative and descriptive. The normative sense focuses on what engineers should do, involving moral values, ethical codes, and finding solutions to ethical dilemmas. The descriptive sense examines how engineers actually behave, reflecting their beliefs and actions without necessarily justifying them.

Normative Engineering Ethics:

- **Focus:** Establishing principles and standards for ethical conduct in engineering.
- **Key Concepts:**
  - **Moral values:** What is considered right or wrong, good or bad in engineering practice.
  - **Ethical codes:** Sets of rules and guidelines that engineers adhere to, such as those from the (National Society of Professional Engineers) or the
  - **Moral problem-solving:** Applying ethical principles to resolve complex situations involving potential harm, conflicts of interest, or other ethical challenges.
- **Examples:**
  - Honesty and integrity in design and reporting.
  - Prioritizing public safety and welfare.
  - Avoiding conflicts of interest.
  - Respecting intellectual property and confidentiality.

Descriptive Engineering Ethics:

- **Focus:**

Observing and analyzing the actual ethical behavior of engineers in various situations.

- **Key Concepts:**
- **Beliefs and attitudes:** Understanding the underlying motivations and perspectives that influence engineers' decisions.
- **Observed actions:** Documenting how engineers respond to ethical dilemmas in real-world contexts.
- **Examples:**
- How engineers handle safety concerns when cost pressures exist.
- How engineers respond to situations involving environmental impact.
- How engineers handle potential whistleblowing situations.

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UNIT –II

ENGINEERING ETHICS

SENSES OF 'ENGINEERING ETHICS'

The word ethics has different meanings but they are correspondingly related to each other. In connection with that, Engineering ethics has also various senses which are related to one another.

Comparison of the senses of Ethics and 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. 2. Ethics is a means of contrasting moral questions from non-moral problems. 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. 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.	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. Engineering Ethics gives a total view of the moral problems and how to solve these issues specifically related to engineering field. 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. 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.

VARIETY OF MORAL ISSUES

There are so many engineering disasters which are greater / heavier than the level of acceptable or tolerable risk. Therefore, for finding and avoiding such cases such as nuclear plant accident at Chernobyl (Russia), Chemical plant at Bhopal (India) where a big disaster of gas leakage, occurred in 1980, which caused many fatal accidents. In the same way, oil spills from some oil extraction plants (the Exxon Valdez plant), hazardous waste, pollution and other related services, natural disasters like floods, earth quake and danger from using asbestos and plastics are some more cases for engineering disasters. These fields should be given awareness of engineering ethics. Hence, it is essential for engineers to get awareness on the above said disasters. They should also know the importance of the system of engineering.

When malfunction of the system is a rapid one, the disaster will be in greater extent and can be noticed immediately. When they ate slow and unobserved, the impact is delayed. So, the engineers should not ignore about the functions of these systems.

These cases also explain and make the engineers to be familiar with the outline of the case in future and also about their related ethical issues.

Approaches to Engineering Ethics:

are aware of this, but they do not change the disposal method because their competitors also doing similarly as it happens to be a cheaper. They also say that it is the responsibility of the local government.

The above given examples clearly explain how the ethical problems arise most often because of wrong judgments and expectations of engineers. These necessitate for establishing some codes of conduct which has to be imposed on engineers' decisions on the basis of ethical view.

TYPES OF INQUIRY

Inquiry means an investigation. Like general ethics, Engineering ethics also involves investigations into values, meaning and facts. These inquiries in the field of Engineering ethics are of three types.

1. Normative Inquiries
2. Conceptual Inquiries
3. Factual or Descriptive Inquiries

Normative Inquiries

These inquiries are mostly helpful to identify the values which guide the individuals and groups in taking a decision. These are meant for identifying and justifying some norms and standards of morally desirable nature for guiding individuals as well as groups. In most of the cases, the normative questions are given below:

1. How do the obligations of engineers protect the public safety in given situations?
2. When should an engineer have to alarm their employers on dangerous practices?
3. Where are the laws and organizational procedures that affect engineering practice on moral issues?
4. Where are the moral rights essential for engineers to fulfill their professional obligations?

From these questions, it is clear that normative inquiries also have the theoretical goal of justifying moral judgments.

Conceptual Inquiries

These are meant for describing the meaning of concepts, principles, and issues related to Engineering Ethics. These inquiries also explain whether the concepts and ideas are expressed by single word or by phrases. The following are some of the questions of conceptual inquiries:

pMORAL DILEMMAS

Why study engineering ethics?

Engineering ethics is not only teaching moral behaviour in knowing about immoral and amoral in a set of beliefs, but also increasing the ability of engineers and other professionals to face boldly with the moral problems arising from technological advancements, changes and other related activities. This can be possible be imparted among the engineers, only through college courses, seminars, etc. which are involved individual study.

Moral Dilemmas

Dilemmas are certain kind of situations in which a difficult choice has to be made.

Moral dilemmas can also be called moral problems. Moral dilemmas have two or more foldings - moral obligations, duties, rights, goods or ideals come into disagreement with each other. One moral principle can have two or more conflicting of two different directions. In this case, that individual has to choose a better one among them on the basis of the importance and the applicability. For example, an engineer has given a promise to his employer and another one to a colleague. If it is difficult to fulfill both the promises, he can drop off one promise which is of least importance. If he explains the situations to his colleagues, it can be understood.

The problems of disagreement

The individuals and groups in engineering companies may disagree with resolving moral problems in difficult situations. The disagreement will be normally about how to interpret, apply and balance the moral problems. In this situation they have to use the following steps to resolve the problems.

Steps / Procedures in facing / confronting moral dilemmas

All the above said three problems pave the way for the need of several steps in resolving the moral dilemmas. All the steps are interrelated and they can also be used jointly.

1) Identifying the relevant moral factors and reasons: i.e. Finding solutions for (i) the conflicting responsibilities (ii) the competing rights and (iii) the clashing ideals involved.
2) Collecting and gathering all the available facts which are relevant to the moral factors while resolving.
3) Ranking the moral considerations or principles on the basis of importance as applicable to the situation. But sometimes it is not possible when the objective is to find a way to meet equally urgent responsibilities and to promote equally important ideals.
4) Considering alternative courses of action for resolving the problems and tracing the full implications of each. i.e. conducting factual inquiries.
5) Having talked with the colleagues, friend about the problem getting their suggestions and alternative ideas on resolving that dilemma and
6) Arriving at a careful and reasonable judgment or solution by taking into consideration of all important moral factors and reasons on the basis of the facts or truths. But it seems to be difficult.

To conclude, only the study of Engineering Ethics can help in developing the skills and attitudes to follow the above steps in resolving a moral problem among the engineers and other professionals by means of case studies, class room discussions and debating.

1. The engineers must have the competence for identifying the moral problems and ethical issues related to the field of engineering – they must have the ability to distinguish and relate these moral problems with the problems of law, economics, religions principles etc. They must possess the skills of understanding, clarifying and assessing the arguments which are against the moral issues.
2. They must have the ability to suggest the solutions to moral issues, on the basis of facts. These suggestions must be consistent and must include all the aspects of the problem.
3. They must have the imaginative skill to view the problems from all view points and also be able to suggest a proper alternative solution.
4. They must be able to tolerate while giving moral judgments and decisions which may cause trouble. i.e. they have to understand the difficulties in making moral decisions.
5. They must have adequate knowledge and understanding about the use of ethical language so as to defend or support their views with others.
6. They must have some better knowledge in understanding the importance of suggestions and better solutions while resolving moral problems and also about the importance of tolerance on some critical situations.
7. They must understand the importance of maintaining the moral honesty i.e. the personal convictions and beliefs and individual's professional life must be integrated. They must have this skill of doing so.

Conclusion

From the above decisions on moral autonomy, we can conclude that moral autonomy helps an engineer to increase his moral outlook in an appreciable manner. It also helps him to be morally responsible in his daily activities.