

# Ethics and Engineering

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# What is ethics?

## ✓ Definition of ethics

Moral principles that govern a person's behaviour or the conducting of an activity.

## Synonyms of ethics

- ✓ **Moral code** or **moral stand/principles/values**
- ✓ **Rights and wrong**
- ✓ **Principles**
- ✓ **Rules of conduct** or **Code of conduct**



# Professional Ethics

“Why should I study ethics? I am already an ethical person.”

- The general answer is: You are not being asked to study ethics in general, but your **professions ethics**
- Then the next question comes: **What is the difference?**



# What is a Profession?

Oxford Shorter Dictionary says:

*the occupation which one professes to be skilled in and to follow. . . . A vocation in which professed knowledge of some branch of learning is used in its application to the affairs of others, or in the practice of an art based upon it.*

A more comprehensive definition is needed

- This brief historical account
- Not sufficient for our purposes
- It has limited insight into the nature of professionalism



# Professionalism: from Sociological perspective

- ① A tactic to gain power or advantage in the marketplace
- ② Professions have considerable power in the marketplace to command high salaries/benefits
- ③ It dictates a transition from a mere occupation to a profession



# Characteristics of Professionalism: Sociological context

- **Extensive training:** Today, most professionals have at least a bachelors degree from a college or university, and many professions require more advanced degrees, which are often conferred by a professional school.
- **Vital knowledge and skills:** Professionals knowledge and skills are vital to the **well-being of the larger society**. Example: Physician, lawyer, accountant. Think of a pilot's skill in a air flight.



# Characteristics of Professionalism: Sociological context (Cont.)

- **Control of services:** Professions usually have a monopoly on, or at least considerable control over, the provision of professional services in their area. This control is **achieved in two ways:**

## ✓ Professional School

The profession convinces the community that only those who have **graduated from a professional school** should be allowed **to hold the professional title**. Often controlled by : establishing **accreditation standards** that regulate the quality, **curriculum content**, and **number of such schools**.

## ✓ Licensing

It attempts to persuade the community that there **should be a licensing system** for those who want to enter the profession. Those who practice **without a license** are subject to **legal penalties**.



# Characteristics of Professionalism: Sociological context (Cont.)

## Autonomy in the workplace

- They have **unusual degree of autonomy**. You can not ask a doctor why he is giving you this medicine/test.
- Autonomy is **more evident** in **private practice**.
- Even in large organisations they may exercise a large degree of **individual judgement and creativity**.
- This is one of **the most satisfying aspects** of professional work.
- This is **because** professional has **sufficient knowledge** to determine the appropriate professional services in a given situation.





# Characteristics of Professionalism: Sociological context (Cont.)

## Claim to ethical regulation

- The actions must be regulated by ethical standards, many of which are embodied in a code of ethics.
- Most professions attempt to limit these abuses by regulating themselves for the public benefit.
- Sometimes professional societies attempt to punish members who **violate their codes**.
- These regulatory agencies are controlled by professionals themselves, and so the claim to genuine ethical regulation is sometimes seen to be **suspicious**.



# Professionalism Sociological context: How good is this?

- It considers both functions: **altruistic (self-less) and self-interest**.
- It can be viewed as a tool for **promoting the economic self-interest** of professionals.
- Thus, there is a certain amount of **moral cynicism** in this analysis, or perhaps **amoralism**. (that is not moral )
- So, we need ethical **commitment in a stronger place**.



# Professions as Social Practices

- This account of professionalism begins with an **analysis of a concept**, not with empirical research. **experimental**
- A profession is an example of **a social practice**.
- Every social practice **has one or more aims or goods** that are especially associated with it or internal to it. For example, medicine (along, of course, with nursing, pharmacy, osteopathy, and the like) aims at the health of patients.
- A social practice is **unthinkable** **inconceivable without this distinctive aim/objective**. For example: We cannot imagine **medicine** apart from the aim of **producing health** or **law** without the aim of **producing justice**.
- The aims of a social practice must be **morally justifiable aims**. Both health and justice are morally praiseworthy aims.
- It has a distinctively moral orientation. **There cannot be a profession of thievery or robbery.**



# A Socratic Account of Professionalism

Definition given by: Philosopher Michael Davis

*A profession is a number of individuals in the same occupation voluntarily organised to earn a living by openly serving a moral ideal in a morally permissible way beyond what law, market, morality, and public opinion would otherwise require.*

It highlights the following features:

- A profession **cannot be composed of only one person.**
- A profession involves a **public element.**
- A profession is **a way people earn a living** and is usually something that occupies them during their working hours. A profession is still an occupation (a way of earning a living).



## Features from the Definition (Cont.)

- People enter into **voluntarily** and that they can leave voluntarily.
- Davis believes that a profession must serve some **morally praiseworthy goal**.
- Professionals must pursue a morally praiseworthy goal by **morally permissible means**. For example, medicine cannot pursue the goal of health **by cruel experimentation**.
- It obligates professionals to act in some **exclusive way** (not found by common people).



# Is Engineering a profession?

## Sociological or economic analysis

- Engineering seems to **qualify only as a borderline profession.**
- Engineers have **extensive training** and possess **knowledge and skills that are vital to the public.**
- However, engineers do not have anything like **complete control** of engineering services. Many engineering do not require licensing.
- Finally, **engineers who work in large organisations and are subject to the authority of managers and employers** may have **limited autonomy.**



# Is Engineering a profession? (Cont.)

## Davis Definition

Davis definition allows engineering full professional status.

- Engineering is a **group activity**.
- It demands special **knowledge, skill, and judgement**.
- Most engineers **earn their living** by engineering.
- It is entered into **voluntarily**.
- Engineering serves a **morally good end**.



# Types of Ethics or Morality

How does professional ethics differ from other types of ethics?

## Type I: Common morality.

- It 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.
- It is wrong to murder, lie, cheat or steal, break promises, harm others physically.





# Common morality: Characteristics

## I. Based on Negative precepts

- Many of the precepts/clauses of common morality are **negative**.
- It is designed primarily **to protect individuals** from various types of **violations**.
- **Example:** I can violate your personhood by **lying** to you, **stealing** from you, and so forth.
- These are called **Donts**.

## II. Also has Positive precepts

- It also contains a positive or aspirational component such as **Prevent killing, Prevent deceit, Prevent cheating** and so on.
- However, it might also include **even more clearly positive precepts**, such as **Help the needy, Promote human happiness, and Protect the natural environment**.
- These are **Do's**.



# Common morality: Characteristics (Cont.)

## III. Action and Intention

- There is a **distinction** between an evaluation of a **persons actions** and an **evaluation of his intention**.
- **Example:** If a driver kills a pedestrian in his automobile accidentally, he may be charged with manslaughter (or nothing) but not murder. The pedestrian is just as dead as if he had been murdered, but the drivers 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**.



# Types of Ethics or Morality (Cont.)

## Type II: Personal Morality.

- Personal ethics or personal morality is the set of **moral beliefs that a person holds**.
- Personal moral beliefs **closely parallel the precepts of common morality**.
- So, murder, lying, cheating, and stealing are wrong.
- But there are areas where common morality is unclear or silent. Here personal morality differs. **For example:** Thus, we may oppose stem cell research, even though common morality may not be clear on the issue. Same is true about **human cloning**.



# Types of Ethics or Morality (Cont.)

## Type III: Professional Ethics/Morality

- 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**.



# Professional Ethics: Characteristics

## I. Formal declaration

- Unlike common morality and personal morality, professional ethics is usually **stated in a formal code.**
- Professional societies usually have codes of ethics, referred to as **code of professional responsibility, code of professional conduct, code of conducts** and so on..
- **Example:** American Society of Civil Engineers, American Society of Mechanical Engineers, IEEE and ACM. The various codes of ethics do **differ in some important ways.**



# Professional Ethics: Characteristics (Cont.)

## II. Every profession is different

- The professional codes of ethics of a given profession **focus on the issues that are important in that profession.** For instance: ACM will deal with Copyright, Patent while lawyer will not focus on it. They will focus on clients justice.



# Professional Ethics: Characteristics (Cont.)



## III. Professional ethics **dominates** personal morality

- Professional ethics is supposed to **take precedence over personal morality**.
- The advantage is that a patient or client can **justifiably have certain expectations of a professional**, even if the patient or client has **no knowledge of the personal morality of the professional**.
- **Example I** : When a patient enters a physicians examining room, she can expect the **conversations there to be kept confidential**, even if **she does not know anything about the personal morality of the physician**.



### III. Professional ethics dominates personal morality (Cont.)

#### Professional ethics dominates (Cont.)

- **Example II:** When a client or employer **reveals details of a business relationship** to an engineer, he can expect the engineer **to keep these details in confidence**, even though **he knows nothing about the personal morality of the engineer**.
- In both cases, these expectations are **based on knowledge of the professional ethics** of medicine and engineering, **not on knowledge of the professionals personal morality**.





### III. Professional ethics dominates personal morality (Cont.)

Conflict between personal and professional ethics!!

A complication occurs when the professionals personal morality and professional ethics conflict.



## IV. Professional and moral ethics: varying degree of restrictions

### Varying degree of restrictions

- Sometimes professional ethics is more restrictive than personal morality, and sometimes it is less restrictive.

### Personal ethics wins

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.



## IV. Professional and moral ethics: varying degree of restrictions

### Varying degree of restrictions (Cont.): Professional ethics wins

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.



## IV. Professional ethics has both negative and positive dimension

### Both negative and positive dimension

- Being ethical has two aspects: preventing and avoiding evil and doing or promoting good.
- ✓ • The negative aspect of professional ethics is oriented toward the prevention of professional malpractice and harm to the public : called **preventive ethics**.
- ✓ • More positive dimension of professional ethics called **aspirational ethics** because it encourages aspirations or ideals in professionals to promote the welfare of the public.



## Preventive ethics : Negative dimension

- Commonly formulated in **rules**.
- The rules are often in the **form of prohibitions** (directly or indirectly).
- **Example:** 80% of code of National Society of Professional Engineers (NSPE) are **prohibitive** or **negative**.
- **Example:** *Engineers **shall not** reveal facts, data, or information without the prior consent of the client or employer except as authorized by law or this Code.*
- **Example:** *Engineers shall **approve only** those engineering documents that are in conformity with applicable standards.*



## Preventive ethics : Why?

- Common morality support the idea that the first duty of moral agents, including professionals, is not to harm others not to murder, lie, cheat, or steal, for example.
- The codes are formulated in terms of rules that can be enforced, and it is easier to enforce negative rules than positive rules.
- The influence of what are often called **disaster cases**, which are incidents that resulted, or could have resulted, in loss of life or harm due to technology.



## Preventive ethics : The DC-10 Case

- The DC-10, a wide-bodied aircraft, was introduced into commercial service in 1972 (aviation competition was at the peak at that time in US).
- Since the cargo area is pressurized as well as the cabin, it must be able to withstand pressures up to 38 pounds per square inch.
- During the first year of service, a rear cargo door that was **improperly closed** blew open over Windsor, Ontario. Luckily, a skilled pilot was able to land the plane successfully.



# Preventive ethics : The DC-10 Case

- Convair **engineer** Dan Applegate **expressed doubts** about it after 2 weeks.
- But **managers rejected** his expression.
- On March 3, 1974, soon after takeoff on a flight from Paris to London, the cargo door of a plane broke off, resulting in a **crash that killed 346 passengers**.

The DC-10 Case: What it says:

**Engineers tried** to prevent disasters but was **defeated by managers** in their attempt.





# Aspirational ethics : Positive dimension

## Limitation of Preventive ethics

- It has relative absence of the motivational dimension.
- Rather, the financial rewards and social position become more dominating factor.

## Inspirational factors exist!!

- They are attracted by the prospect of making a difference in the world, and doing so in a positive way.
- They are excited by projects that:
  - alleviate human suffering through improved medical devices.
  - eliminate disease by providing clean water and sanitation.
  - create automobiles that run on less fuel and are less polluting.
  - design system that will reduce common peoples suffering and time remarkably.
  - design system that should improve the level of social security.



# Aspirational ethics : Good Works

- **The Sealed-Beam Headlight:** A group of General Electric engineers on their own time in the late 1930s developed the sealed beam headlight, which greatly reduced the number of accidents caused by night driving.
- **Air Bags:** Carl Clark helped to develop air bags. Even though he was a scientist and not a degreed engineer, his work might well have been done by an engineer.
- **Disaster Relief:** Redrick C. Cuny attended engineering school, but he never received his degree in engineering due to poor grades.....Afterwards he successfully organised relief aid in Bosnia and Iraq.
- **Engineers Without Borders:** **Example:** Engineering students from the University of Arizona chapter are working on a water supply and purification project in the village of Mafi Zongo, Ghana, West Africa. The project will supply 30 or more villages, with approximately 10,000 people, with safe drinking water.



# The Good Engineer: Characteristics

- ① **Professional Pride:** S/he must do is be sure that her/his **professional expertise is at the highest possible level**. Professional expertise in engineering includes **not only the obvious proficiencies** in mathematics and engineering science **but also** those **capacities and sensitivities** that only come with a certain level of experience.
- ② **Social Awareness:** An awareness of the way in which technology **both affects and is affected** by the larger **social environment**. Engineers should take the right decision to launch any technology considering the social impact.
- ③ **Environmental Consciousness:** **Human welfare** will be seen as **integral** to preserving the integrity of the natural environment that supports human and all other forms of life.
- ④ **Cases...read..**



# End of Chapter!!!!

