Unit II

Sense of ‘Engineering Ethics’ - Variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg’s theory - Gilligan’s theory - Consensus and Controversy - Models of Professional Roles & Professionalism - theories about right action - Self-interest - customs and religion - uses of ethical theories.

Sense of ‘Engineering Ethics’

- Ethics refers to a set of beliefs, attitudes, and habits that a person or group displays concerning morality
- Ethics is a purely factual matter about explaining beliefs and actions related to morality.
- Ethics refers to being “Morally correct”
  - People’s action can be spoken as ‘ethical’ or ‘unethical’
  - Individuals can be evaluated as ‘ethical’ or ‘unethical’
- Ethics is an Activity of
  - Understanding the moral values
  - Resolve the moral issues
  - Justify the moral judgment

What is Engineering Ethics?

- Engineering Ethics is an activity of
  - Understanding the moral values that ought to guide the engineering profession
  - Resolve the moral issues in the profession
  - Justify the moral judgment concerning the profession.

- **Ethical methodologies** and **theories** are a set of tools to be used in dealing with ethical issues. It is always useful to divide a moral problem into **factual, conceptual, application, and moral components**. Deciding whether and how **line-drawing and creative-middle-way solutions, and utilitarian, Resptect for Person, and virtue ethics approaches** should be used must be left to the judgment of the person facing an ethical dilemma. Thinking of the three theory approaches as partial and incomplete models of common morality can aid in understanding how the three moral theories or approaches should be used in applied ethics.
- **Ross and Gert** have attempted to summarize common morality in duties and rules, and **Davis** has offered several tests for the moral acceptability of actions that reflect ideas in common morality and the classic moral theories. It is also important to know that moral judgments can evaluate actions or practices as **permissible, impermissible, obligatory, or supererogatory** and that moral evaluations can be of particular actions, general practices, or very general moral criteria. Finally, in **moral evaluation in common morality, the intention behind** an action can be critically important.

Components of a Moral Problem

- **Factual Issues -** Questions of fact relevant to the resolution of a moral problem.
- **Conceptual Issues -** Questions about the meanings of terms relevant to the resolution of a moral problem.
- **Application Issues** - Questions about whether and how a term applies in a situation.
- **Moral Issues** - Questions about how conflicting moral considerations relevant to the resolution of a moral problem should be weighed or balanced.

Types of Moral Judgments

Permissible. One is morally permitted, but not morally required, to perform an action. An engineer might decide to take a job with Company X rather than Company Y, but both actions are permissible. It would also be permissible to take neither job.

Impermissible. An action that one is morally required not to do. An engineer must not be a part of an undisclosed conflict of interest.

Obligatory. An action one is morally required to do. An engineer must disclose an actual or a potential conflict of interest.

Supererogatory. An action that is praiseworthy if one does it, but not morally required. An engineer designs a parking lot for a nonprofit organization without charging a fee. Sometimes we call these actions ones that go above and beyond the call of duty.

Common Morality

- The first account is by philosopher W. D. Ross, who constructed a list of basic duties or obligations, which he called prima facie (at first sight, or before closer inspection) duties.
- In using these terms, Ross intended to convey the idea that although any given duty is usually obligatory, it can be overridden by another duty in special circumstances.

Ross’s Prima Facie (First Sight) Duties

- R1. Duties resting on previous acts: (a) Duties of fidelity (to keep promises and not to tell lies), (b) Duties of reparation for wrong done
- R2. Duties of gratitude (e.g., to parents and benefactors)
- R3. Duties of justice (e.g., to support happiness in proportion to merit)
- R4. Duties of beneficence (to improve the condition of others)
- R5. Duties of self-improvement
- R6. Duties not to injure others

Davis Eight Moral Tests

- **Harm Test.** Does this option do less harm than any available alternative?
- **Publicity Test.** Would I want my choice of this option published in the newspaper?
- **Defensibility Test.** Could I defend my choice of this option before a Congressional committee, a committee of my peers, or my parents?
- **Reversibility Test.** Would I still think my choice of this option is good if I were one of those adversely affected by it?
- **Virtue Test.** What kind of person would I become if I chose this option often?
- **Professional Test.** What would my profession s ethics committee say about this option?
- **Colleague Test.** What would my colleagues say when I describe my problem and suggest this option as my solution?
- **Organization Test.** What would the organizations ethics officer or legal counsel say about my option?

- **Moral development** is the process in which a person develops proper attitudes and behaviors. Carol Gilligan created a new moral development theory based on the theory that her teacher, Lawrence Kohlberg, presented. Kohlberg's **justice-based morality** theory suggested that all people moved through three stages of moral development, with only men being able to achieve the highest level since they tend to view all problems as conflicts where only one person is right. Gilligan's theory challenges this view by first stating that Kohlberg's theory does not accurately address **gender differences** and the **caring perspective** of women.
- Gilligan named her theory **Ethics of Care** because it is based on **care-based morality**, which states that people (predominately women) move through stages where they try to find a balance between caring for themselves and others. The first stage is the **pre-conventional** stage, where a person only cares about herself, the second stage is the **conventional** stage where a person begins to care for others, oftentimes neglecting their own needs and consequences, and the third stage is the **post-conventional** stage, where a person cares for themselves and others and makes decisions based on how their decisions may make others feel while also not neglecting the consequences of heir own actions.

Kohlberg’s Theory of Moral Development

Gilligan’s Stages of the Ethic of Care

The Utilitarian Approach

- The fundamental principle of the utilitarian model of common morality is We should maximize overall well-being. We refer to the population over which well-being is maximized as the *audience*
- **The Cost-Benefit Test**
- If a utilitarian approach requires that we maximize well-being, how should we go about determining the criteria we should use in seeking this maximization?
- It appeal from the engineering perspective is *cost-benefit analysis* (CBA), which holds that the *course of action that produces the greatest benefit or utility relative to cost should be chosen.*

Gewirth’s Hierarchy of Rights

- **Tier 1.** The most basic rights, the essential preconditions of action: for example, life, physical integrity, and mental health.
- **Tier 2**. Rights to maintain the level of purpose fulfillment one already has, such as the right not to be deceived or cheated, the right to informed consent to unusual risks, the right not to have possessions stolen, the right not to be defamed, and the right not to suffer broken promises.
- **Tier 3**. The rights necessary to increase one s level of purpose fulfillment: for example, the right to attempt to acquire property and wealth.

RESPECT FOR PERSONS APPROACH

- The fundamental principle of the RP model of common morality is Act so that you respect **all humans as free and equal moral agents**. This equal regard for moral agents can be understood as a basic requirement of justice. A moral agent must be distinguished from knives or airplanes, which can only fulfill goals or purposes that are imposed upon them from the outside. Inanimate objects cannot evaluate actions from a moral standpoint. A paradigm example of a moral agent is a normal adult human being who, in contrast to inanimate objects, can formulate goals or purposes of his or her own. Such a being is said to have *autonomy*.

The Golden Rule Test

- RP theory places great importance on the Universalization Principle, and it may offer the most plausible explanation of why it is so important.
- *Reversibility* is a special application of the Universalization Principle, because the idea of universalization implies that a judgment should not change simply because the roles are reversed.
- **The Self-Defeating Test:** The Golden Rule does not by itself provide all the criteria that must be met to satisfy the RP standard, but its requirements of universalizability and reversibility are vital steps in satisfying that standard.

VIRTUE ETHICS APPROACH

- A virtue is usually described as a dispositional trait, that is, a character trait that disposes or inclines a person to do the right thing. A virtue can be described as both deep and wide. It is deep in the sense that a virtue is a firmly entrenched habit that leads a person to consistently act in a certain way and to which he is strongly committed.

Core Virtues and Selected Character Strengths

1. Wisdom (creativity, open-mindedness, perspective)
2. Courage (bravery, persistence, vigor or energy)
3. Humanity (love, kindness)
4. Justice (citizenship, fairness, leadership)
5. Temperance (modesty, self-control)
6. Transcendence (appreciation of beauty and excellence, gratitude, spirituality)

Desirable Qualities in Engineers

- Basic engineering competence
- Professional integrity
- Honesty
- Willingness to make self-sacrifice
- Working well with others
- Imaginativeness
- Perseverance
- Communicating clearly with others
- Commitment to objectivity
- Openness to acknowledging and correcting
- mistakes
- Commitment to quality
- Ability to see the big picture, as well as
- minute details
- Civic-mindedness

Applicable Engineering Standards

- Regulatory: specifying technical requirements (e.g., for safety)
- Procedural: e.g., procedures to be followed for determining measurable quality or level of safety
- Standard of Care: that level or quality of service ordinarily provided by other normally competent practitioners, contemporaneously providing similar services in the same locality and under the same circumstances.
- Judgment: needed because regulatory and procedural standards, and the standard of care still require the exercise of good judgment

IKIGAI

The Japanese Secret to a Long and Happy Life

Héctor García
and Francesc Miralles

Translated by Heather Cleary

Our ikigai is different for all of us, but one thing we have in common is that we are all searching for meaning. When we spend our days feeling connected to what is meaningful to us, we live more fully; when we lose the connection, we feel despair.

Modern life estranges us more and more from our true nature, making it very easy for us to lead lives lacking in meaning. Powerful forces and incentives **(money, power, attention, success)** distract us on a daily basis; don't let them take over your life.

Our intuition and curiosity are very powerful **internal compasses to help us connect** with our ikigai. Follow those things **you enjoy,** and get away from or change those you dislike. Be led by your curiosity, and keep busy by doing things that fill you with meaning and happiness. It doesn't need to be a big thing: we might find meaning in being good parents or in helping our neighbors.

There is no perfect strategy to connecting with our ikigai. But what we learned from the Okinawans is that we should not worry too much about finding it. Life is not a problem to be solved. Just remember to have something that keeps you busy doing what you love while being surrounded by the people who love you.

- Stay active; don’t retire. Those who give up the things they love doing and do well lose their purpose in life. That’s why it’s so important to keep doing things of value, making progress, bringing beauty or utility to others, helping out, and shaping the world around you, even after your “official” professional activity has ended.
- Take it slow. Being in a hurry is inversely proportional to quality of life. As the old saying goes, “Walk slowly and you’ll go far.” When we leave urgency behind, life and time take on new meaning.
- Don’t fill your stomach. Less is more when it comes to eating for long life, too. According to the 80 percent rule, in order to stay healthier longer, we should eat a little less than our hunger demands instead of stuffing ourselves.
- Surround yourself with good friends. Friends are the best medicine, there for confiding worries over a good chat, sharing stories that brighten your day, getting advice, having fun, dreaming . . . in other words, living.

- Get in shape for your next birthday. Water moves; it is at its best when it flows fresh and doesn’t stagnate. The body you move through life in needs a bit of daily maintenance to keep it running for a long time. Plus, exercise releases hormones that make us feel happy.
- Smile. A cheerful attitude is not only relaxing—it also helps make friends. It’s good to recognize the things that aren’t so great, but we should never forget what a privilege it is to be in the here and now in a world so full of possibilities.
- Reconnect with nature. Though most people live in cities these days, human beings are made to be part of the natural world. We should return to it often to recharge our batteries.
- Give thanks. To your ancestors, to nature, which provides you with the air you breathe and the food you eat, to your friends and family, to everything that brightens your days and makes you feel lucky to be alive. Spend a moment every day giving thanks, and you’ll watch your stockpile of happiness grow.

- Live in the moment. Stop regretting the past and fearing the future. Today is all you have. Make the most of it. Make it worth remembering.

- Follow your ikigai. There is a passion inside you, a unique talent that gives meaning to your days and drives you to share the best of yourself until the very end. If you don’t know what your ikigai is yet, as Viktor Frankl says, your mission is to discover it.

Big Five Test …

- The Big Five personality test is a comprehensive personality inventory based on decades of psychological research. Psychologists and academic researchers investigating the fundamental traits of personality found repeatedly that people's personality differences naturally sort into five broad dimensions, referred to as the Big Five.

Personality Test:

- The "Big Five" or Five Factors refers to the five major personality dimensions that psychologists have determined are core to our individual makeup. The Big Five personality traits are:
- Openness - How open a person is to new ideas and experiences
- Conscientiousness - How goal-directed, persistent, and organized a person is
- Extraversion - How much a person is energized by the outside world
- Agreeableness - How much a person puts others' interests and needs ahead of their own
- Neuroticism - How sensitive a person is to stress and negative emotional triggers
- Each of the Big Five personality traits is considered to drive a significant aspect of cognition (how we think) and behavior (how we act). Each trait is completely distinct and independent of the other four traits; for instance, a highly Extraverted person is no more or less likely to be highly Conscientious as well.

Case …

- On February 11, 2010, the leaders of the European Union (EU) agreed on a plan to bail out Greece, a country that had **joined the EU in 1981** and was admitted to the European Monetary Union (EMU), allowing Greece to adopt the euro as its currency in 2001. Greece had been **unable to pay its bills or to borrow more money** to do so because it had overspent its income on its social programs and other projects. In the aftermath of providing Greece with bailout credit ultimately totalling **€100 billion** ($147 billion), questions were asked about how this could have happened. A spotlight was brought to bear on how **Goldman Sachs** (GS) had enabled Greece to qualify for adopting the euro in the first place and for providing the means to hide some transactions in which Greece pledged its future revenues in return for instant cash to spend. In a sense, GS helped Greece draw a veil over its finances with arrangements that were not transparent.

Case …

- In 2001, Greece wanted to join the EMU but faced a requirement that its ratio of debt to **gross domestic product (GDP)** ratio be less than 60%. Unfortunately, Greece had some debt that was payable in U.S. dollars (USD) and other debt in Japanese yen. Both currencies had grown in value relative to the euro in 1999 and 2000. Under EU rules, such unhedged debt had to be valued and reported at the year-end exchange rates, so **Greece faced the prospect reporting increased debt liabilities**. In late 2000 and 2001, GS proposed and arranged two types of hedges that reduced reported Greek debt by €2.367 billion and allowed Greece to access unreported, **off-balance-sheet financing**

Case …

- Currency hedges that turned the USD and yen debt payments into euro payments and subsequently the Greek swap portfolio into new cross-currency swaps valued using a historical implied foreign exchange rate rather than market value exchange rate. Since the historical exchange rate was lower than the market rate at the time, the resulting valuation of the debt was reduced by almost €2.4 billion ($3.2 billion). Interest rate swaps that, when coupled with a bond, provided Greece with instant cash in 2001 in return for pledging future landing fees at its airports. GS was reportedly paid $300 million for this transaction. A similar deal in 2000 saw Greece pledge the future revenue from its national lottery in return for cash. Greece was obligated to pay GS substantial amounts until 2019 under these agreements but chose to sell these interest rate swaps to the National Bank of Greece in 2005 after criticism in the Greek Parliament. In essence, through these so-called interest rate swaps, Greece was converting a stream of variable future cash flows into instant cash.

Case …

- But, although there was a fierce debate among EU finance ministers, these obligations to pay out future cash flows were not required to be disclosed in 2001 and were therefore a type of “off-balance-sheet financing.” In 2002, the requirements changed, and these obligations did require disclosure. Humorously, the 2000 deal related to a legal entity called Aeolos that was created for the purpose—Aeolos is the Greek goddess of wind. In response to public criticism, GS argues on its website that “these transactions [both currency and interest rate hedges] were consistent with the Eurostat principles governing their use and disclosure at the time.”6 In addition, GS argues that the reduction of €2.367 billion had “minimal effect on the country’s overall fiscal situation in 2001” since its GDP was approximately $131 billion and its debt was 103.7% of GDP.7 However, it is not clear how much cash was provided by the so-called interest rate swaps that allowed Greece to report lower debt obligations in total.

The Unfolding of the Fukushima Daiichi Nuclear Accident …

- On March 11, 2011, the Great East Japan earthquake with a magnitude of 9.0, occurring 130 km offshore, caused a major tsunami, approximately thirteen meters high, that hit the coast of Japan.1 One of the affected areas was the Fukushima Daiichi nuclear power plant, which hosts six reactors, three of which were operational at the time of the earthquake. In line with their design, the operational reactors automatically “scrammed,” that is, the control rods were instantly inserted into the reactor core to reduce the nuclear fission and the heat production.2 However, as a result of the earthquake the plant was disconnected from its power lines; the connection with the electricity grid was needed for cooling down the reactor core. When all external power was completely lost, the emergency diesel generators kicked in to cool the reactor cores: this was another built-in design measure to improve safety. The real problem started to unfold when forty-five minutes after the earthquake the ensuing tsunami reached the coast: a series of waves inundated the plant causing serious damage, as a result of which eleven of the twelve emergency generators stopped working. When reactors are designed, the complete loss of external power from electricity grids and from the internal power of the diesel generators – a situation referred to as “station blackout” – is anticipated. In a blackout, batteries come into action that can continue the cooling of the reactor. However, the problem was that the batteries were also flooded in reactors

- 1 and 2, while reactor 3 had a functioning battery that continued working for about thirty hours. More importantly, the problems in the Fukushima Daiichi accident were not only attributable to a lack of electricity. Soon after the tsunami had inundated the plant, the seawater pumps that were supposed to remove the extracted heat from the reactors were destroyed by the tsunami.3 In boiling water reactors of the type operational in Fukushima Daiichi, water in a primary loop circulates around the reactor core, which produces enormous amounts of heat; that water then starts boiling and becomes the driving force of generators that produce electricity. The hot water is then cooled down through a secondary loop that takes away the heat from the primary loop. Cooled water then reenters the reactor core. The secondary loop is often connected to “fresh” sources of cool water, which explains why nuclear reactors are often built close to seas or rivers. So, even if electricity had been on supply, no fresh water from the sea could have irculated in the secondary loop. When the heated water could no longer be removed, the cooling water in the primary loop inside the reactor started to evaporate, turning into steam. That in turn oxidized the zirconium cladding that surrounded the extremely hot nuclear fuels. As a result, massive amounts of hydrogen were produced.

- The accumulation of hydrogen – in addition to the high pressure caused by the steam – led to an explosion in reactors 1 and 3. Since reactors 3 and 4 were connected with each other through their vent system, hydrogen also accumulated in reactor 4, leading to an explosion one day later. While reactor 4 was not operational at the time of the accident, it did host a large number of fuel rods in the spent fuel pools. Spent fuel rods are often kept in such a location to cool down before being shipped off. As was the case in the reactor cores, because of a lack of cooling, the water in the pools soon evaporated and after the explosion, the pool was unshielded and exposed to the open air.

- All the explosions led to the large-scale emission of radiation into the atmosphere. Ironically, the biggest concern surrounding the nuclear accident in Fukushima Daiichi did not relate to the reactors but rather to the spent fuel rods in the nonoperational reactor. In a report, the Japanese government revealed that for a time it had even considered evacuating Tokyo, when it was not clear whether the pool could be managed and properly contained. Evacuating Tokyo, a city of 35 million people, could have easily led to many casualties and injuries, much distress, and major financial losses.5 It was indeed the convergence of several failures – “the perfect storm” – and the cascading effects that gave rise to one of the largest nuclear accidents in the history of nuclear power production. As a result, 300,000 people in the direct area were evacuated, many of whom have since returned to their homes.

The Aftermath of the Disaster

- In November, 2017, six and half years after the accident, I visited the Fukushima prefecture, together with colleagues from the International Commission on Radiation Protection (ICRP). Upon our arrival in Fukushima City, the very first reminder of the accident was the air-monitoring stations on every major street corner that constantly monitored radiation levels, sometimes in real time and sometimes in the old-fashioned way with levels chalked up on small boards that were updated several times a day. Depending on the direction and the strength of the wind, there were days when radiation could shoot up to higher levels, but generally the boards were there to put across the “reassuring” message that the radiation levels in Fukushima City were far lower than the legally acceptable levels, at least at the time when I visited the city The impact of the accident was most visible when I left the city. There were still many black bags literally behind many of the houses. This was a reminder of the first days after exposure but also of the first days after people were allowed to return to their homes, when the government had instructed the population on how to clean up radiation residue on the roofs and everything else that had been exposed to large amounts of radiation.

Radiation level at glance …

- The radiation levels I registered in the days I spent there were around 0.135 microsieverts per hour (μSv/h). Please note that radiation exposure is always linked to time. In other words, the period of exposure – in addition to the radiation intensity – very much matters for the health impacts. It is, however, much more common to communicate legal exposure limits per year (rather than per hour). For instance, in different national legislation it is indicated that levels of radiation of 2 to 3 millisievert per year (mSv/y) are acceptable. The level of radiation registered by me in November, 2017 corresponds to 1.2 mSv/y, which is a considerable amount of radiation but still below the threshold line.

Assessing Technological Risk

- Introducing new technology to society often brings great benefits, but it can also create new and significant risks. Understandably, much of the focus in engineering has been on addressing these risks with respect to different technologies and industries (e.g., the chemical industry) to assess, understand, and manage such risks. For instance, in the chemical industry, risk assessment methods have been proposed for describing and quantifying "the risks associated with hazardous substances, processes, actions, or events." One of the most systematic approaches to assessing risk is the probabilistic risk assessment or probabilistic safety assessment

The Big Five Factors are (chart recreated from John & Srivastava, 1999):

Big Five Dimensions	Facet (and correlated trait adjective)
Extraversion vs. introversion	Gregariousness (sociable) Assertiveness (forceful) Activity (energetic) Excitement-seeking (adventurous) Positive emotions (enthusiastic) Warmth (outgoing)
Agreeableness vs. antagonism	Trust (forgiving) Straightforwardness (not demanding) Altruism (warm) Compliance (not stubborn) Modesty (not show-off) Tender-mindedness (sympathetic)
Conscientiousness vs. lack of direction	Competence (efficient) Order (organized) Dutifulness (not careless) Achievement striving (thorough) Self-discipline (not lazy) Deliberation (not impulsive)
Neuroticism vs. emotional stability	Anxiety (tense) Angry hostility (irritable) Depression (not contented) Self-consciousness (shy) Impulsiveness (moody) Vulnerability (not self-confident)
Openness vs. closedness to experience	Ideas (curious) Fantasy (imaginative) Aesthetics (artistic) Actions (wide interests) Feelings (excitable) Values (unconventional)

HONESTY

- The third canon of the code of ethics of the Institute of Electrical and Electronics Engineers (IEEE) encourages all members "to be honest and realistic in stating claims or estimates based on available data.
- Form of Dishonesty:
  - Lying
  - Deliberate (Technical matters in a manner that implies knowledge that he does not have to impress an employer o r potential customer, then he is certainly engaging in deliberate deception)
  - Withholding information
  - Failure to seek out the truth.

MATCH BEHAVIOR WITH VALUES

Demonstrate our positive personal values in all we do and say. Be sincere and real.

LEARN FROM MISTAKES

View failures as feedback that provides us with the information we need to learn, grow and succeed.

SPEAK WITH PURPOSE

Think before we speak. Make sure your intention is positive and your words are sincere.

MAKE THE MOST OF EVERY MOMENT

Focus our attention on the present moment. Keep a positive attitude.

TAKE RESPONSIBILITY FOR ACTIONS

Be responsible for our thoughts, feelings, words and actions. 'Own' the choices you make and the results that follow.

BE WILLING TO DO THINGS DIFFERENTLY

Recognize what's not working and be willing to change what you are doing to achieve your goal.

BE BALANCED

Balance is about considering everything that's meaningful and important to us when we make choices about how we spend our time and energy. When we find the right balance, we are happy, healthy, satisfied and productive.

Theories About Right Action-

- "***Golden mean***" ethics (Aristotle, 384 – 322 B.C.). The best solution is achieved through reason and logic and is a compromise or "*golden mean*" between extremes of excess and deficiency.
- *For example*, in the case of the environment, the golden mean between the extremes of neglect and exploitation might be protection.
- Problem : Variability from one person to another in their powers of reasoning and the difficulty in applying the theory to ethical problems.

- "***Rights – based***" ethics (John Locke, 1632 – 1704). Every person is free and equal and has the right to life, health, liberty and possessions (in effect prohibiting capital punishment, medical charges, jails and income taxes).
- Problem : One person's right may be in conflict with another's rights.

- “***Duty – based***” ethics (Immanual Kant, 1724 – 1804). Each person has a duty to follow a course of action that would be universally acceptable for everyone to follow without exception. (Thus we would all be honest, kind, generous and peaceful).
- Problem : Universal application of a rule can be harmful.

- “***Utilitarian***” ethics (John Stuart Mill, 1806 – 1873). The best choice is that which produces the maximum benefit for the greatest number of people (which could endanger minority rights).
- Problem : Quantification of the benefits can be difficult.

Definition – Professional and Profession

- The word ‘Professional’ gets different meanings based on the context. In general ‘Professional’ relates to any work that a person does for an occupation, especially work which requires a special skill or training.

- “Profession” means a type of job that requires special training and that brings a fairly high status, for example – work connected with medicine, law and education.

Professionalism can be achieved through the following criteria:

- **Knowledge :** The job/work must include complicated skills, theoretical knowledge a clear judgment and caution. Preparation of a person to do a job requires some formal education, like technical studies as well as humanistic studies, etc.
- **Organization :** Some special societies or organizations must be formed for the profession .These societies and organizations must be accepted by the public to set the standards for that profession, writing code of ethics of that profession and also these organizations have to represent that profession to the public. For example societies like ISTE, IEEE etc.
- **Public Good :** The Job/work must help the public by doing a favour to them quoted in its code of ethics. For example, medicine is for promoting health, law is for protecting the legal rights of the public and engineering towards improving the public’s health, safety and welfare with the help of technological advancements.

Uses of Ethical Theories

- Ethical theories provide part of the decision-making **foundation for Decision Making** When Ethics Are In Play because these theories represent the viewpoints from which individuals seek guidance as they make decisions.
  - Each theory emphasizes different points – a different decision-making style or a decision rule—such as predicting the outcome and following one's duties to others in order to reach what the individual considers an ethically correct decision.
  - In order to understand ethical decision making, it is important for students to realize that not everyone makes decisions in the same way, using the same information, employing the same decision rules.
  - In order to further understand ethical theory, there must be some understanding of a common set of goals that decision makers seek to achieve in order to be successful. Four of these goals include beneficence, least harm, respect for autonomy, and justice.

Three Types of Enquiry are

- Normative Enquiry - Normative Enquiry is the most central, which seek to identify the values that should guide individuals and groups
- Factual Enquiry - Factual Enquiry or Descriptive Enquiry or Explanatory Enquiry, which seek to uncover information bearing upon value issues and identify the key factors that call for specific actions.
- Conceptual Enquiry - Conceptual Enquiry are directed towards clarify the meaning of concepts, principles and issues in Engineering Ethics.

Moral Dilemmas

- Moral Dilemmas are certain kind of situations in which a difficult choice has to be made for the Moral Problems.
- Steps in Moral Dilemmas:
  - Identify the relevant moral factors and reasons.
  - Gather all available facts that are pertinent to the moral factors involved.
  - Rank the moral considerations in order of importance as they apply to the situation.
  - Consider alternative courses of actions as ways of resolving dilemma, tracing the full implications of each.
  - Get suggestions and alternative perspectives on the dilemma.

Model of a Profession: The required elements of an IT Profession include

- Professionalism is often defined as the strict adherence to courtesy, honesty and responsibility when dealing with individuals or other companies in the business environment.
- This trait often includes a high level of excellence going above and beyond basic requirements. Work ethic is usually concerned with the personal values demonstrated by business owners or entrepreneurs and instilled in the company’s employees.
- The good work ethic may include completing tasks in a timely manner with the highest quality possible and taking pride in completed tasks.

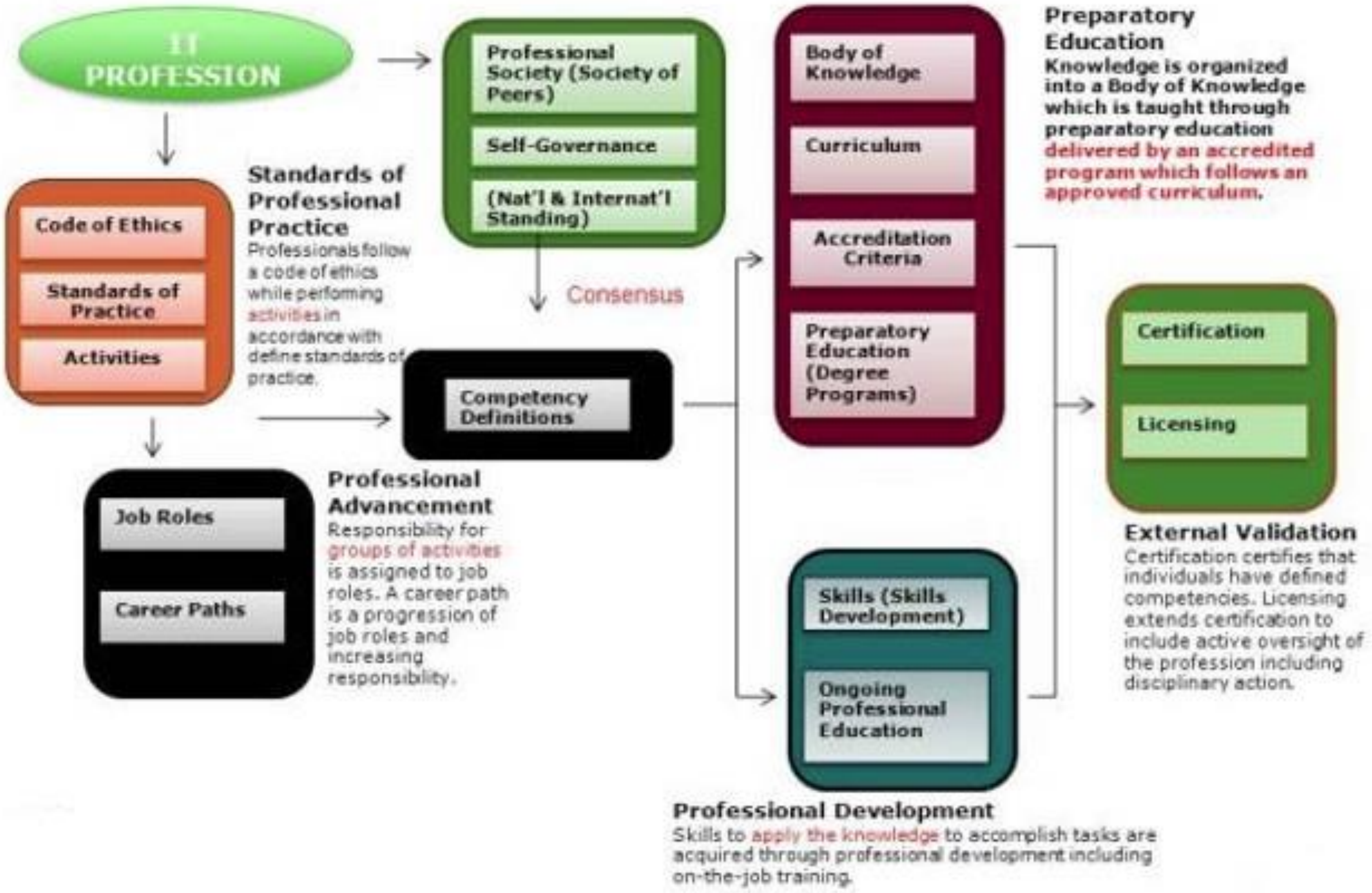
- The term ‘morality’ concerns with
- (a) what ought or ought not to be done in a given situation,
- (b) what is right or wrong in handling it,
- (c) what is good or bad about the persons, policies and principles involved in it.
- If an action is said to be morally right or a principle is said to be morally good, then they are said to be had some moral reasons in supporting it.

Engineering Ethics

Approaches to Engineering Ethics:

- i. Micro-Ethics: This approach stresses more about some typical and everyday problems which play an important role in the field of engineering and in the profession of an engineer.
- ii. Macro-Ethics: This approach deals with all the social problems which are unknown and suddenly burst out on a regional or national level.

Model of an IT Profession



MODELS OF PROFESSIONAL ROLES:Promotion of public good is the primary concern of the professional engineers. There are several role models to whom the engineers are attracted. These models provoke their thinking, attitudes and actions.

- **Savior:**

  The engineer as a savior, save the society from poverty, illiteracy, wastage, inefficiency, ill health, human (labor) dignity and lead it to prosperity, through technological development and social planning.

  - **Robert Louis Stevenson** was a Scottish novelist, essayist, poet and travel writer. He is best known for works such as Treasure Island

- **Guardian**

  He guards the interests of the poor and general public. As one who is conversant with technology development, is given the authority befitting his expertise to determine what is best suited to the society. For example, Lawrence of Arabia (an engineer).

Professional Roles

- **Bureaucratic Servant** He serves the organization and the employers. The management of an enterprise fixes its goals and assigns the job of problem solving to the engineer, who accepts the challenge and shapes them into concrete achievements. For example, Jamshedji Tata.
- **Social Servant** It is one who exhibits social responsibility. The engineer translates the interest and aspirations of the society into a reality, remembering that his true master is the society at large. For example, Sir M.Viswesvarayya.

Social Enabler and Catalyst One who changes the society through technology. The engineer must assist the management and the society to understand their needs and make informed decisions on the desirable technological development and minimize the negative effects of technology on people and their living environment. Thus, he shines as a social enabler and a catalyst for further growth. For example, Sri Sundarlal Bahuguna. (Sunderlal Bahuguna Ji (9 January 1927 – 21 May 2021) was an Indian environmentalist and Chipko movement leader. The idea of the Chipko movement was suggested by his wife and him. He fought for the preservation of forests in the Himalayas, first as a member of the Chipko movement in the 1970s,)

Game Player He is neither a servant nor master. An engineer is an assertive player, not a passive player who may carry out his master's voice. He plays a unique role successfully within the organization, enjoying the excitement of the profession and having the satisfaction of surging ahead in a competitive world. For example, Narayanamurthy, Infosys and Dr. Kasthurirangan, ISRO. Krishnaswamy Kasturirangan (born 24 October 1940) is an Indian space scientist who headed the Indian Space Research Organisation (ISRO) from 1994 to 2003.[1] He is presently Chancellor of Central University of Rajasthan and NIIT University.[3] He is the former chancellor of Jawaharlal Nehru University.

Question Pattern and Key for CIA I

- Answer in One word (5)
- Answer in One Sentence (5)
- Short Answer (5*2=10)
- List and Model Answer (3*4 = 12)
- Big Answer (2*5 = 10)
- Case Study (1*8=8)

Importance of Code of Ethics

Codes of ethics state the moral responsibilities of engineers as seen by the profession and as represented by a professional society. Because they express the profession's collective commitment to ethics, codes are enormously important, not only in stressing engineers' responsibilities but also in supporting the freedom needed to meet them.

Codes of ethics play at least eight essential roles: serving and protecting the public, providing guidance, offering inspiration, establishing shared standards, supporting responsible professionals, contributing to education, deterring wrongdoing, and strengthening a profession's image.

Skills required to be included are:

1. Moral awareness: Proficiency in recognizing moral problems and issues in engineering
2. Cogent moral reasoning: Comprehending, clarifying, and assessing arguments on opposing sides of moral issues
3. Moral coherence: Forming consistent and comprehensive viewpoints based on consideration of relevant facts
4. Moral imagination: Discerning alternative responses to moral issues and finding creative solutions for practical difficulties
5. 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

These are the *direct* goals in college courses. They center on cognitive skills—skills of the intellect in thinking clearly and cogently. It is possible, however, to have these skills and yet not act in morally responsible ways. Should we therefore add to our list of goals the following goals that specify aspects of moral commitment and responsible conduct?

6. Moral reasonableness: The willingness and ability to be morally reasonable
7. Respect for persons: Genuine concern for the well-being of others as well as oneself
8. Tolerance of diversity: Within a broad range, respect for ethnic and religious differences and acceptance of reasonable differences in moral perspectives
9. Moral hope: Enriched appreciation of the possibilities of using rational dialogue in resolving moral conflicts
10. Integrity: Maintaining moral integrity and integrating one's professional life and personal convictions

Five Aspects of Engineering Decisions:

Whitbeck identifies five aspects of engineering decisions that highlight important aspects of many moral decisions in general. First, usually there are alternative solutions to design problems, more than one of which is satisfactory or "satisfices."

Second, multiple moral factors are involved, and among the satisfactory solutions for design problems, one solution is typically better in some respects and less satisfactory in other respects when compared with alternative solutions.

Third, some design solutions are clearly unacceptable. Designs of the child seat that violate the applicable laws or impose unnecessary hazards on infants are ruled out. In general, there are many "background constraints," for example justice and decency, which limit the range of reasonable moral options.

Fourth, engineering design often involves uncertainties and ambiguities, not only about what is possible and how to achieve it, but also about the specific problems that will arise as solutions are developed.

Finally, design problems are dynamic. In the real world the design of the child seat would go through much iteration, as feedback was received from testing and use of the child seat.

Discussion Questions

With regard to each of the following cases, answer several questions. First, what is the moral dilemma (or dilemmas), if any? In stating the dilemma, make explicit the competing moral reasons involved. Second, are there any concepts (ideas) involved in dealing with the moral issues that it would be useful to clarify? Third, what factual inquiries do you think might be needed in making a reliable judgment about the case? Fourth, what are the options you see available for solving the dilemma? Fifth, which of these

options is required (obligatory, all things considered) or permissible (all right)?

Case 1. An inspector discovers faulty construction equipment and applies a violation tag, preventing its continued use. The inspector's supervisor, a construction manager, views the case as a minor infraction of safety regulations and orders the tag removed so the project will not be delayed. What should she do?

Example for a Case study question:

1. Identify the moral values, issues, and dilemmas, if any, involved in the following cases, and explain why you consider them moral values and dilemmas.
   a. 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.