

SRI SHAKTHI
INSTITUTE OF ENGINEERING AND TECHNOLOGY

Approved by AICTE, New Delhi & affiliated to Anna University, Chennai, Tamilnadu.

College Code: 2727



POWERING THE YOUTH
EMPOWERING THE NATION

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Handbook on Human Values and Professional Ethics

Quality education is the fundamental right of every Indian citizen. Quality Education lays the good foundation for Individual growth. Sri Shakthi Institute of Engineering and Technology is committed to impart quality education, to create skilled man power for the nation.

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About Institute:

Sri Shakthi Institute of Engineering and Technology (SSIET) was established in the year 2006 with approval of All India Council for Technical Education (AICTE), New Delhi, and is affiliated to Anna University, Chennai. The primary vision of the institute is to impart technical knowledge and skills to the students in accordance with the needs of the industry by producing technologically superior and ethically strong engineers to transform life as a whole..

Vision statement:

"To make the institution one of our nation's great engineering schools, recognized nationally and internationally for excellence in teaching, research and public service. We seek to be the preferred destination for students, practitioners seeking an engineering education, employers hiring engineering graduates and organizations seeking engineering knowledge."

Mission statements:

"To provide an encouraging environment to develop the intellectual capacity, critical thinking, creativity and problem solving ability of the students."

OBJECTIVES:

(Engineering Ethics & Human Values)

- To understand the moral values that ought to guide the Engineering profession, Resolve the moral issues in the profession,
- To justify the moral judgment concerning the profession.
- Intended to develop a set of beliefs, attitudes, and habits that engineers should display concerning morality.
- To create an awareness on Engineering Ethics and Human Values.
- To inspire Moral and Social Values and Loyalty.
- To appreciate the rights of others.

The prime objective of the Professional Ethics is to develop ability to deal effectively with moral complexity in engineering students of as follows.

TO IMPROVEMENT OF THE COGNITIVE SKILLS: (SKILLS OF THE INTELLECT IN THINKING CLEARLY):

- Moral awareness (proficiency in recognizing moral problems in engineering)
- convincing moral reasoning (comprehending, assessing different views)
- Moral coherence (forming consistent viewpoints based on facts)
- Moral imagination (searching beyond obvious the alternative responses to issues and being receptive to creative solutions)
- Moral communication, to express and support one's views to others.

TO ACT IN MORALLY DESIRABLE WAYS: (TOWARDS MORAL COMMITMENT AND RESPONSIBLE CONDUCT):

- Moral reasonableness i.e., willing and able to be morally responsible.
- Respect for persons, which means showing concern for the well-being of others, besides oneself.
- Tolerance of diversity i.e., respect for ethnic and religious differences, and acceptance of reasonable differences in moral perspectives.
- Moral hope i.e., believes in using rational dialogue for resolving moral conflicts.
- Integrity, which means moral integrity, and integrating one's professional life and personal convictions.

MORALS:PART-I HUMAN VALUES

Moral are the worthy ideals or principles that one follows to distinguish the right from the wrong. These ideals or virtues are considered worthy in building up the character of an individual.. They were edited, changed or modified rulers (dynasty) according with the development of knowledge in engineering and technology time to time.

Moral Value refers to the good virtues such as honesty, integrity, truthfulness, compassion, helpfulness, love, respectfulness, hard-work, etc Morality is concerned with principles and practices of morals such as: (a) What ought or ought not to be done in a given situation? (b) What is right or wrong about the handling of a situation? and (c) What is good or bad about the people, policies, and ideals involved?

VALUES:

Humans have the unique ability to define their identity, choose their values and establish their beliefs. All three of these directly influence a person's behavior. People have gone to great lengths to demonstrate the validity of their beliefs, including war and sacrificing their own life! Conversely, people are not motivated to support or validate the beliefs of another, when those beliefs are contrary to their own. People will act congruent with their personal values or what they deem to be important. —**A value is defined as a principle that promotes well-being or prevents harm.** Another definition is: —**Values are our guidelines for our success—our paradigm about what is acceptable.** Personal values are defined as: —**Emotional beliefs in principles regarded as particularly favorable or important for the individual.** Our values associate emotions to our experiences and guide our choices, decisions and actions.

Types of Values

Values related to Right Conduct are:

- (a) Self-help Skills:** Care of possessions, diet, hygiene, modesty, posture, self reliance, and tidy appearance .
- (b) Social Skills:** Good behavior, good manners, good relationships, helpfulness, No wastage, and good environment, and
- (c) Ethical Skills:** Code of conduct, courage, dependability, duty, efficiency ingenuity, initiative,

perseverance, punctuality, resourcefulness, respect for all, and responsibility 2. Values related to PEACE are: Attention, calmness, concentration, contentment, dignity, discipline, equality, equanimity, faithfulness, focus, gratitude, happiness, harmony, humility, inner silence, optimism, patience, reflection, satisfaction, self-acceptance, self-confidence, self-control, self-discipline, self-esteem, self-respect, sense control, tolerance, and understanding .

3. **Values related to Truth are:** Accuracy, curiosity, discernment, fairness, fearlessness, honesty, integrity (unity of thought, word, and deed), intuition, justice, optimism, purity, quest for knowledge, reason, self-analysis, sincerity, spirit of enquiry, synthesis, trust, truthfulness, and determination.

4. **Values related to Love are:** Acceptance, affection, care, compassion, consideration, dedication, devotion, empathy, forbearance, forgiveness, friendship, generosity, gentleness, humanness, interdependence, kindness, patience, patriotism, reverence, sacrifice, selflessness, service, sharing, sympathy, thoughtfulness, tolerance and trust.

5. **Values related to Non-violence are:** (a) **Psychological:** Benevolence, compassion, concern for others, consideration, forbearance, forgiveness, manners, happiness, loyalty, morality, and universal love (b) **Social:** Appreciation of other cultures and religions, brotherhood, care of environment, citizenship, equality, harmlessness, national awareness, perseverance, respect for property, and social justice.

INTEGRITY:

Integrity is defined as the unity of thought, word and deed (honesty) and open mindedness. It includes the capacity to communicate the factual information so that others can make well-informed decisions. It yields the person's 'peace of mind', and hence adds strength and consistency in character, decisions, and actions. This paves way to one's success. It is one of the self-direction virtues. It enthruses people not only to execute a job well but to achieve excellence in performance. It helps them to own the responsibility and earn self-respect and recognition by doing the job. Moral integrity is defined as a virtue, which reflects a consistency of one's attitudes, emotions, and conduct in relation to justified moral values. Integrity comes in many forms, but honesty and dependability are two traits that are expected in most workplace situations. Without responsible behavior, distrust can make a work environment tense and uncomfortable. A strong work ethic shows co-workers and clients that you're reliable and take your responsibilities

seriously. Polite communication, respectable behavior and fiscal responsibility also help you stand out as a trustworthy employee.

EXAMPLES OF INTEGRITY AT WORKPLACE:

The biggest workplace challenge is said to be the employee's work ethics showing up to work every day (interest in work and attendance), showing up to work on time (punctuality), taking pride in the quality of their work, commitment to the job, and getting along with others. This situation demands inculcation of good character in the workplace by employees.

Character It is a characteristic property that defines the behavior of an individual. It is the pattern of virtues (morally-desirable features). Character includes attributes that determine a person's moral and ethical actions and responses. It is also the ground on which morals and values blossom. People are divided into several categories, according to common tendencies such as ruthless, aggressiveness, and ambition, constricting selfishness, stinginess, or cheerfulness, generosity and goodwill. Individuals vary not only in the type of their character but also in the degree. Those whose lives are determined and directed by the prevailing habits, fashions, beliefs, attitudes, opinions and values of the society in which they live have at best a developed social as opposed to an individual character.

Follow Institutional Policies: Abiding by institution policies is a powerful way to demonstrate integrity. Cutting corners and neglecting to follow workplace regulations can lead to mistakes, problems and even dangerous situations. **Service Learning:** Service-learning seeks to engage individuals in activities that combine both community service and academic learning. Because service-learning programs are typically rooted in formal courses (core academic, elective, or vocational), the service activities are usually based on particular curricular concepts that are being taught. Service-learning is a teaching method which combines community service with academic instruction as it focuses on critical, reflective thinking and civic responsibility. Service-learning programs involve students in organized community service that addresses local needs, while developing their academic skills, sense of civic responsibility, and commitment to the community. **Service-Learning Program Provides Educational Experiences:** Under which students learn and develop through active participation in thoughtfully organized service experiences that meet actual community needs and that are coordinated in collaboration with school and community.

The engineering student analyzing and executing a socially-relevant project is another example of service learning. The service learning is a methodology falling under the category of experiential education. It is one of the forms of experiential learning and community service opportunities.

It is distinguished in the following ways:

1. **Connection to curriculum:** Integrating the learning into a service project is a key to successful service learning. Academic ties should be clear and built upon existing disciplinary skills.
2. **Learner's voice:** Beyond being actively engaged in the project, trainees have the opportunity to select, design, implement, and evaluate their service activity.
3. **Reflection:** Structured opportunities are created to think, talk, and write about the service experience. The balance of reflection and action allows the trainee to be constantly aware of the impact of their work.
4. **Partners in the community:** Partnership with community agencies are used to identify genuine needs, provide mentorship, and contribute input such as labor and expertise towards completing the project.

SERVICE-LEARNING BENEFITS:

Service-Learning benefits students by:

- Linking theory to practice
- Deepening understanding of course materials
- Enhancing the sense of civic responsibility through civic engagement
- Allowing students to explore possible career paths
- Stressing the importance of improving the human condition
- Developing relevant career-related skills
- Providing experience in group work and interpersonal communication
- Promoting interaction with people from diverse backgrounds
- Instilling a sense of empowerment that enhances self-esteem

Service-Learning benefits faculty by:

- Providing exciting new ways to teach familiar material
- Offering professional development challenges

- ❑ Engaging faculty in meaningful interactions with the community at large
- ❑ Encouraging faculty to form close, interactive, mentoring relationships with students
- ❑ Reminding faculty of the direct consequences of their teaching for society
- ❑ Connecting faculty across academic disciplines through a shared approach to teaching and learning process.

CIVIC VIRTUE:

Civic virtues are the moral duties and rights, as a citizen of the village or the country or an integral part of the society and environment. An individual may exhibit civic virtues by voting, volunteering, and organizing welfare groups and meetings.

The duties are:

- ✓ To pay taxes to the local government and state, in time.
- ✓ To keep the surroundings clean and green.
- ✓ Not to pollute the water, land, and air by following hygiene and proper garbage disposal. For example, not to burn wood, tyres, plastic materials, spit in the open, even not to smoke in the open, and not to cause nuisance to the public, are some of the civic (duties) virtues.
- ✓ To follow the road safety rules.

On the other hand, the rights are:

- To vote the local or state government.
- To contest in the elections to the local or state government.
- To seek a public welfare facility such as a school, hospital or a community hall or transport or communication facility, for the residents.
- To establish a green and safe environment, pollution free, corruption free, and to follow ethical principles. People are said to have the right to breathe in fresh air, by not allowing smoking in public.
- People have inalienable right to accept or reject a project in their area. One has the right to seek legal remedy, in this respect, through public interest petition
- Civic virtues as indispensable for a self-governing administration.

These virtues are divided into four categories:

1. Civic Knowledge

Citizens must understand what the Constitution says about how the government is working, and what the government is supposed to do and what not to do. We must understand the basis of our responsibilities as citizens, besides duties and rights.

2. Self-Restraint

For citizens to live in a free society with limited government each citizen must be able to control or restrain himself; otherwise need a police state—that is, a dictatorial government to maintain safety and order.

3. Self-Assertion

Self-assertion means that citizens must be proud of their rights, and have the courage to stand up in public and defend their rights.

4..Self-Reliance

Citizens who cannot provide for themselves will need a large government to take care of them. Once citizens become dependent on government for their basic needs, the people are no longer in a position to demand that government act within the confines of the Constitution. Self-reliant citizens are free citizens in the sense that they are not dependent on others for their basic needs.

RESPECT FOR OTHERS:

This is a basic requirement for nurturing friendship, team work, and for the synergy it promotes and sustains. The principles enunciated in this regard are:

- ✓ Recognize and accept the existence of other persons as human beings, because they have a right to live, just as you have.
- ✓ Respect others' ideas (decisions), words, and labor (actions). One need not accept or approve or award them, but shall listen to them first. One can correct or warn, if they commit mistakes. Some people may wait and watch as fun, if one falls, claiming that they know others' mistakes before and know that they will fall! Appreciate colleagues and subordinates on their positive actions. Criticize constructively and encourage them. They

are bound to improve their performance, by learning properly and by putting more efforts.

- ✓ Show ‘goodwill’ on others. Love others. Allow others to grow. Basically, the goodwill reflects on the originator and multiplies itself on everybody. This will facilitate collinearity, focus, coherence, and strength to achieve the goals.

LIVING PEACEFULLY:

To live peacefully, one should start install peace within (self). Charity begins at home. Then one can spread peace to family, organization where one works, and then to the world, including the environment. Only who are at peace can spread peace. You can’t gift an article which you do not possess. The essence of oriental philosophy is that one should not fight for peace. It is oxymoron. War or peace can be won only by peace, and not by wars!

One should adopt the following means to live peacefully, in the world:

Nurture:

Get

- ✓ Order in one’s life (self-regulation, discipline, and duty).
- ✓ Pure thoughts in one’s soul (loving others, blessing others, friendly, and not criticizing or hurting others by thought, word or deed).
- ✓ Creativity in one’s head (useful and constructive).
- ✓ Beauty in one’s heart (love, service, happiness, and peace).

- ✓ Good health/body
(Physical strength for service to enjoy the academic environment in the institution).

Act

- ✓ Help the needy with head, heart, and hands (charity). Service to the poor is considered holier than the service to God.
- ✓ Not hurting and torturing others physically, verbally, or mentally.

The following are the factors that promote living, with internal and external peace:

- Conducive environment (safe, ventilated, illuminated and comfortable).
- Secured job and motivated with ‘recognition and reward’.
- Absence of threat or tension by pressure due to limitations of money or time.

- Absence of unnecessary interference or disturbance, except as guidelines.
- Healthy labor relations and family situations.
- Service to the needy (physically and mentally-challenged) with love and sympathy.

CARING:

Caring is feeling for others. It is a process which exhibits the interest in, and support for, the welfare of others with fairness, impartiality and justice in all activities, among the employees, in the context of professional ethics. It includes showing respect to the feelings of others, and also respecting and preserving the interests of all others concerned. Caring is reflected in activities such as friendship, membership in social clubs and professional societies, and through various transactions in the family, fraternity, community, country and in international councils.

SHARING:

Primarily, caring influences sharing. Sharing is a process that describes the transfer of knowledge (teaching, learning, and information), experience (training), commodities (material possession) and facilities with others. The transfer should be genuine, legal, positive, voluntary, and without any expectation in return. However, the proprietary information should not be shared with outsiders. Through this process of sharing, experience, expertise, wisdom and other benefits reach more people faster. Sharing is voluntary and it can't be driven by force, but motivated successfully through ethical principles. In short, sharing is charity

For the humanity, sharing is a culture. The happiness and wealth are multiplied and the crimes and sufferings are reduced, by sharing. It paves the way for peace and obviates militancy. Philosophically, the sharing maximizes the happiness for all the human beings. In terms of psychology, the fear, divide, and distrust between the haves and have-nots disappear. Sharing not only paves the way to prosperity, early and easily, and sustains it. Economically speaking, benefits are maximized as there is no wastage or loss, and everybody gets one's needs fulfilled and satisfied. Commercially speaking, the profit is maximized. Technologically, the productivity and utilization are maximized by sharing.

HONESTY:

Honesty is a virtue, and it is exhibited in two aspects namely,

- Truthfulness
- Trustworthiness.

Truthfulness is to face the responsibilities upon telling truth. One should keep one's word or promise. By admitting one's mistake committed (one needs courage to do that!), it is easy to fix them. Reliable engineering judgment, maintenance of truth, defending the truth, and communicating the truth, only when it does 'good' to others, are some of the reflections of truthfulness. But trustworthiness is maintaining integrity and taking responsibility for personal performance. People abide by law and live by mutual trust. They play the right way to win, according to the laws or rules (legally and morally). They build trust through reliability and authenticity. They admit their own mistakes and confront unethical actions in others and take tough and principled stand, even if unpopular.

Honesty is mirrored in many ways. The common reflections are:

- Beliefs (intellectual honesty).
- Communication (writing and speech).
- (c) Decisions (ideas, discretion).
- (d) Actions (means, timing, place, and the goals). and
- (e) Intended and unintended results achieved.
- As against this, some of the actions of an engineer that leads to dishonesty are:
- Lying: Honesty implies avoidance of lying. An engineer may communicate wrong or distorted test results intentionally or otherwise. It is giving wrong information to the right people.
- Deliberate deception: An engineer may judge or decide on matters one is not familiar or with insufficient data or proof, to impress upon the customers or employers. This is a self deceit.
- Withholding the information: It means hiding the facts during communication to one's superior or subordinate, intentionally or otherwise.
- Not seeking the truth: Some engineers accept the information or data, without applying their mind and seeking the truth.
- Not maintaining confidentiality: It is giving right information to wrong people. The engineers

should keep information of their customers/clients or of their employers confidential and should not discuss them with others.

- Giving professional judgment under the influence of extraneous factors such as personal benefits and prejudice. The laws, experience, social welfare, and even conscience are given a go-bye by such actions. Certainly this is a higher-order crime.

COURAGE:

Courage is the tendency to accept and face risks and difficult tasks in rational ways. Self-confidence is the basic requirement to nurture courage. Courage is classified into three types, based on the types of risks, namely

- Physical courage,
- Social courage, and
- Intellectual courage.

In physical courage, the thrust is on the adequacy of the physical strength, including the muscle power and armaments. People with high adrenalin, may be prepared to face challenges for the mere ‘_thrill’ or driven by a decision to ‘_excel’. The social courage involves the decisions and actions to change the order, based on the conviction for or against certain social behaviors. This requires leadership abilities, including empathy and sacrifice, to mobilize and motivate the followers, for the social cause. The intellectual courage is inculcated in people through acquired knowledge, experience, games, tactics, education, and training. In professional ethics, courage is applicable to the employers, employees, public, and the press.

Look before you leap. One should perform Strengths, Weakness, Opportunities, and Threat (SWOT) analysis. Calculate (estimate) the risks, compare with one’s strengths, and anticipate the end results, while taking decisions and before getting into action. Learning from the past helps. Past experience (one’s own or borrowed!) and wisdom gained from self-study or others will prepare one to plan and act with self-confidence, succeed in achieving the desired ethical goals through ethical means. Opportunities and threat existing and likely to exist in future are also to be studied and measures to be planned.

This anticipatory management will help anyone to face the future with courage.

VALUING TIME:

Time is rare resource. Once it is spent, it is lost forever. It can't be either stored or recovered. Hence, time is the most perishable and most valuable resource too. This resource is continuously spent, whether any decision or action is taken or not.

The history of great reformers and innovators have stressed the importance of time and valuing time. The proverbs, 'Time and tide wait for nobody' and 'Procrastination is the thief of time' amply illustrate this point.

An anecdote to highlight the 'value of time' is as follows: To realize the value of one year, ask the student who has failed in the examinations; To realize the value of one month, ask the mother who has delivered a premature baby; to realize the value of one week, ask the editor of weekly; to realize the value of one day, ask the daily-wage laborer; to realize now the value of one hour, ask the lovers longing to meet; to realize the value of one minute, ask a person who has missed the train; to realize the value of one second, ask the person who has survived an accident; to realize the value one milli-second, ask the person who has won the bronze medal in Olympics; to realize the value of one micro second, ask the NASA team of scientists; to realize the value of one nano-second, ask a Hardware engineer!; If you have still not realized the value of time, wait; are you an Engineer?

COOPERATION:

It is a team-spirit present with every individual engaged in engineering. Co-operation is activity between two persons or sectors that aims at integration of operations (synergy), while not sacrificing the autonomy of either party. Further, working together ensures, coherence, i.e., blending of different skills required, towards common goals.

Willingness to understand others, think and act together and putting this into practice, is cooperation. Cooperation promotes co linearity, coherence (blend), co-ordination (activities linked in sequence or priority) and the synergy (maximizing the output, by reinforcement). The whole is more than the sum of the individuals. It helps in minimizing the input resources (including time) and maximizes the outputs, which include quantity, quality, effectiveness, and efficiency.

The impediments to successful cooperation are:

- Clash of ego of individuals.
- Lack of leadership and motivation.

Conflicts of interests, based on region, religion, language, and caste. Ignorance and lack of interest. By careful planning, motivation, leadership, fostering and rewarding team work, professionalism and humanism beyond the ‘_divides’, training on appreciation to different cultures, mutual understanding ‘_cooperation’ can be developed and also sustained.

COMMITMENT:

Commitment means alignment to goals and adherence to ethical principles during the activities. First of all, one must believe in one’s action performed and the expected end results (confidence). It means one should have the conviction without an iota of doubt that one will succeed. Holding sustained interest and firmness, in whatever ethical means one follows, with the fervent attitude and hope that one will achieve the goals, is commitment. It is the driving force to realize success.

This is a basic requirement for any profession. For example, a design engineer shall exhibit a sense of commitment, to make his product or project designed a beneficial contribution to the society. Only when the teacher (Guru) is committed to his job, the students will succeed in life and contribute ‘_good’ to the society. The commitment of top management will naturally lead to committed employees, whatever may be their position or emoluments. This is bound to add wealth to oneself, one’s employer, society, and the nation at large.

EMPATHY:

Empathy is social radar. Sensing what others feel about, without their open talk, is the essence of empathy. Empathy begins with showing concern, and then obtaining and understanding the feelings of others, from others’ point of view. It is also defined as the ability to put one’s self into the psychological frame or reference or point of view of another, to know what the other person feels. It includes the imaginative projection into other’s feelings and understanding of other’s background such as parentage, physical and mental state, economic situation, and association. This is an essential ingredient for good human relations and transactions.

SELF-CONFIDENCE:

Certainty in one's own capabilities, values, and goals, is self-confidence. These people are usually positive thinking, flexible and willing to change. They respect others so much as they respect themselves. Self-confidence is positive attitude, wherein the individual has some positive and realistic view of himself, with respect to the situations in which one gets involved. The people with self-confidence exhibit courage to get into action and unshakable faith in their abilities, whatever may be their positions. They are not influenced by threats or challenges and are prepared to face them and the natural or unexpected consequences. The self-confidence in a person develops a sense of partnership, respect, and accountability, and this helps the organization to obtain maximum ideas, efforts, and guidelines from its employees.

The people with self-confidence have the following characteristics:

- ✓ A self-assured standing
- ✓ Willing to listen
- ✓ To learn from others and adopt (flexibility),
- ✓ Frank to speak the truth
- ✓ Respect others' efforts and give due credit.

CHARACTER:

It is a characteristic property that defines the behavior of an individual. It is the pattern of virtues (morally-desirable features). Character includes attributes that determine a person's moral and ethical actions and responses. It is also the ground on which morals and values blossom. People are divided into several categories, according to common tendencies such as ruthless, aggressiveness, and ambition, constricting selfishness, stinginess, or cheerfulness, generosity and goodwill. Individuals vary not only in the type of their character but also in the degree. Those whose lives are determined and directed by the prevailing habits, fashions, beliefs, attitudes, opinions and values of the society in which they live have at best a developed social as opposed to an individual character. Following types of characters should be followed by the engineers.

- ✓ Active (great and the mediocre), and
- ✓ The apathetic (purely apathetic or dull), and

- ✓ The intelligent.

Education and Character

The aim of education is not only the cultivation of the intellect but also the formation of moral character. Increased intelligence or physical skill may as easily be employed to the detriment or benefit of the community, if not accompanied by improved will. It is the function of ethics to determine the ideals of human character.

SPIRITUALITY:

Spirituality is a way of living that emphasizes the constant awareness and recognition of the spiritual dimension (mind and its development) of nature and people, with a dynamic balance between the material development and the spiritual development. This is said to be the great virtue of Indian philosophy for Indians. Sometimes, spirituality includes the faith or belief in supernatural power/ God, regarding the worldly events. It functions as a fertilizer for the soil ‘character’ to blossom into values and morals.

Spirituality includes creativity, communication, recognition of the individual as human being (as opposed to a life-less machine), respect to others, acceptance (stop finding faults with colleagues and accept them the way they are), vision (looking beyond the obvious and not believing anyone blindly), and partnership (not being too authoritative, and always sharing responsibility with others, for better returns).

Spirituality is motivation as it encourages the colleagues to perform better. Remember, lack of motivation leads to isolation. Spirituality is also energy: Be energetic and flexible to adapt to challenging and changing situations. Spirituality is flexibility as well. One should not be too dominating. Make space for everyone and learn to recognize and accept people the way they are. Variety is the order of the day. But one can influence their mind to think and act together. Spirituality is also fun. Working is okay, but you also need to have fun in office to keep yourself charged up. Tolerance and empathy are the reflections of spirituality. Blue and saffron colors are said to be associated with spirituality.

Spirituality in the Workplace

Building spirituality in the workplace: Spirituality is promoted in the workplace by adhering to the following activities:

1. Verbally respect the individuals as humans and recognize their values in all decisions and actions.
2. Get to know the people with whom you work and know what is important to them. Know their goals, desires, and dreams too.
3. State your personal ethics and your beliefs clearly in all your actions.
4. Support causes outside the business.
5. Encourage leaders to use value-based discretion in making decisions.
6. Demonstrate your own self-knowledge and spirituality

Spirituality for Corporate Excellence :

The spiritual traits to be developed for excellence in corporate activities are listed as follows:

- 1. Self-awareness** — Realization of self-potential. A human has immense capability but it needs to be developed.
- 2. Alertness** - in observation and quickness in decision making, i.e., spontaneity which includes quick reflexes, no delay but also no hasty decisions.
- 3. Being visionary and value based** — This includes an attitude towards future of the organization and the society, with clear objectives.
- 4. Holism** — Whole system or comprehensive views and interconnected with different aspects. Holistic thinking, which means the welfare of the self, family, organization and the society including all other living beings and environment.

- 5. Compassion** — Sympathy, empathy and concern for others. These are essential for not only building the team but also for its effective functioning.
- 6. Respect for diversity** — It means search for unity in diversity i.e., respect others and their views.
- 7. Moral Autonomy** — It means action based on rational and moral judgment. One need not follow the crowd or majority i.e., band-wagon effect.
- 8. Creative thinking and constant reasoning** — Think if we can do something new and if we can improve further?
- 9. Ability to analyze and synthesize** — Refrain from doing something only traditional.
- 10. Positive views of adversity** — Make adversities one's source of power—a typical Karma yogi's outlook! Every threat is converted into opportunity.
- 11. Humility** — The attitude to accept criticism (it requires courage!) and willing to correct. includes modesty and acknowledging the work of colleagues.
- 12. Sense of vocation** — Treat the duty as a service to society, besides your organization.

PART-II PROFESSIONAL ETHICS

INTRODUCTION

Engineers have an ethical and social responsibility to themselves, their clients and society. Practically (although there is much debate about this), engineering ethics is about balancing cost, schedule, and risk. Engineering ethics is a means to increase the ability of concerned engineers, managers, citizens and others to responsibly confront moral issues raised by technological activities. The awareness of moral issues and decisions confronting individuals and organizations are involved in Engineering & Technology.

ENGINEERING ETHICS: WHY STUDY ENGINEERING ETHICS?

- **Training In Preventive Ethics:**

- Stimulating the moral imagination
- Recognizing ethical issues
- Developing analytical skills
- Eliciting a sense of responsibility
- Tolerating disagreement and ambiguity

➤ **Obstruction to Responsibility:**

- Self-interest.
- Fear.
- Self-deception.
- Ignorance.
- Egocentric tendencies.
- Microscopic vision.
- Groupthink.

➤ **Clearly Wrong Engineering Practices:**

- Lying
- Deliberate deception
- Withholding information
- Failing to adequately promote the dissemination of information
- Failure to seek out the truth
- Revealing confidential or proprietary information
- Allowing one's judgment to be corrupted.

Questionable Engineering Practices:

- Trimming – —smoothing of irregularities to make data look extremely accurate and precise
- Cooking – —retaining only those results that fit the theory and discarding others
- Forging – —inventing some or all of the research data...
- Plagiarism – misappropriating intellectual property.
- Conflicts of interest (such as accepting gifts.) Actual, Potential, Apparent.

➤ **Senses of Expression of Engineering Ethics:**

- Ethics is an activity and area of inquiry. It is the activity of understanding moral values, resolving moral issues and the area of study resulting from that activity.
- When we speak of ethical problems, issues and controversies, we mean to distinguish them

from non-moral problems.

- Ethics is used to refer to the particular set of beliefs, attitudes and habits that a person or group displays concerning moralities.
- Ethics and its grammatical variants can be used as synonyms for ‘morally correct’.

DIFFERENCE IN MORALITY & ETHICS

Morality	Ethics
More general and prescriptive based on customs and traditions.	Specific and descriptive. It is a critical reflection on morals
More concerned with the results of wrong action, when done.	More concerned with the results of a right action, when not done
Thrust is on judgment and punishment, in the name of God or by laws.	Thrust is on influence, education, training through codes, guidelines, and correction
In case of conflict between the two, morality is given top priority, because the damage is more. It is more common and basic.	Less serious, hence second priority only. Less common. But relevant today, because of complex interactions in the modern society
Example: Character flaw, corruption, extortion, and crime.	Example: Notions or beliefs about manners, tastes, customs, and towards laws.

THREE TYPES OF ETHICS:

Common Morality:

Common morality is the set of moral beliefs shared by all Engineering students. It is the basis

for the other types of morality. In ethics, we usually think of such principles as Ahimsa (no harm physically or mentally to or killing others or even suicides), Satyam (no lies and break of promises), Contentment (no greed, cheating or stealing) etc. We don't question these principles. Three characteristics of common morality are identified as follows:

- I. Many of the principles of common morality are negative. The common morality is designed primarily to protect individuals from different types of violations or invasions of their personhood by others, such as killing, lying or stealing.
- II. Although the common morality is basically negative, it certainly contains positive or aspirational features in principles such as, 'Prevent killing, Prevent deceit and prevent cheating'. Further it includes even more positive principles, such as 'Help the needy, Promote human happiness, and protect the environment'. This distinction between the positive and negative aspects of common morality will be important in discussing professional ethics.
- III. The common morality makes a distinction between an evaluation of a person's actions and of his intentions. An evaluation of action is based on moral principles considered, but an evaluation of the person himself is based on one's intention. For example, if a driver kills a pedestrian with his vehicle accidentally, he may be booked for manslaughter but not murder. The pedestrian is just as dead as if he had been murdered, but the driver's intention was not to kill him. The law treats the driver differently, as long as one was not reckless. The end result maybe the same, but the intent is different. He may be morally responsible but not legally for the death. Similarly, if you convey false information to another person with the intent to deceive, you are lying. If you convey the same false information because you do not know any better, you are not lying and not usually as morally culpable. Again, the result is the same (misleading the person), but the intent is different.

Personal Morality:

Personal ethics or personal morality is the set of moral beliefs that a person holds. Our personal moral beliefs mostly and closely run parallel to the principles of common morality, such as ahimsa, satyam and contentment. But our personal moral beliefs may differ from common

morality in some areas, especially where common morality appears to be unclear or in a state of change. Thus, we may oppose abortion, even though common morality may not be clear on the issue.

Professional Ethics:

Professional ethics is the set of standards adopted by professionals. Every profession has its professional ethics: medicine, law, pharmacy etc. Engineering ethics is the set of ethical standards that applies to the engineering profession. Some of the important characteristics of professional ethics are:

- **Formal code:** Unlike common morality and personal morality, professional ethics is usually stated in a formal code. Many such codes are promulgated by various components of the profession.
- **Focus:** The professional codes of ethics of a given profession focus on the issues that are important in that profession. Professional codes in the legal profession concern themselves with questions such as perjury of clients and the unauthorized practice of law.
- **Precedence:** In a professional relationship, professional ethics takes precedence over personal morality. This characteristic has an advantage, but it can also produce complications. The advantage is that a client can justifiably have some expectations of a professional, even if the client has no knowledge of the personal morality of the professional.
- **Restriction:** The 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.
- **Two dimensional:** Professional ethics, like any ethics, has a negative as well as a positive dimension. Being ethical has two aspects: (*a*) preventing and avoiding evil, and (*b*) doing or promoting good.

- **Role morality:** This means the moral obligations based on special roles and relationships. For example, Parents having a set of obligations to their children, such as not to harm their children, nourish them and promote their flourishing. A political leader has a role morality, the obligation to promote the well-being of citizens. Professional ethics is one of the examples of role morality.

WORK ETHIC:

Work ethics is defined as a set of attitudes concerned with the value of work, which forms the motivational orientation. It is a set of values based on hard work and diligence. It is also a belief in the moral benefit of work and its ability to enhance character. A work ethic may include being reliable, having initiative, or pursuing new skills. The ‘work ethics’ is aimed at ensuring the economy (get job, create wealth, earn salary), productivity (wealth, profit), safety (in workplace), health and hygiene (working conditions), privacy (raise family), security (permanence against contractual, pension, and retirement benefits), cultural and social development (leisure, hobby, and happiness), welfare (social work), environment (anti-pollution activities), and offer opportunities for all, according to their abilities, but without discrimination.

Workers exhibiting a good work ethic in theory should be selected for better positions, more responsibility and ultimately promotion. Workers who fail to exhibit a good work ethic may be regarded as failing to provide fair value for the wage the employer is paying them and should not be promoted or placed in positions of greater responsibility. Work ethic is not just hard work but also a set of accompanying virtues, whose crucial role in the development and sustaining of free markets.

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 Ethic:

Ethics	Engineering Ethics
Ethics is an activity which concerns with making investigations and knowing about moral values, finding solutions to moral issues and justifying	Like the ethics, engineering ethics also aims at knowing moral values related to engineering, finding accurate solutions to

moral issues and justifying moral judgments	the moral problems in engineering and justifying moral judgments of engineering.
Ethics is a means of contrasting moral questions from non-moral problems.	Engineering Ethics gives a total view of the moral problems and how to solve these issues specifically related to engineering field
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.	Engineering ethics is also using some currently accepted codes and standards which are to be followed by group of engineers and engineering societies.
As per the definition of dictionaries – 'moral principles' is about the actions and principles of conduct of the people. i.e. ethical or unethical.	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, earthquake 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 are 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:

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.

Macro-Ethics: This approach deals with all the social problems which are unknown and suddenly burst out on a regional or national level.

So, it is necessary for an engineer to pay attention on both the approaches by having a careful study of how they affect them professionally and personally. The engineers have to tolerate themselves with the everyday problems both from personal and societal point of view.

Some cases with which different areas covered by engineering ethics:

An inspector finds a faulty part in the manufacture of a machine, which prevents the use of that machine for a longer period. But his superior, takes this as a minor mistake and orders that the faulty part to be adjusted so that the delay in the process has to be avoided. But the inspector doesn't want this and so he is threatened by the supervisor.

An electronic company applies for a permit to start a Nuclear Power Plant. When the licensing authority comes for visit, they enquire the company authorities on the emergency measures that have been established for safety of the surroundings. The engineers inform them about the alarm system and arrangements have been made in local hospitals for the treatment of their employees and they have no plan for the surrounding people. They also inform that it is the responsibility of the people. A Yarn Dyeing company which dumps its wastes in the nearby river. It causes heavy damage to the people those who are using the river. The plant engineers 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 mostoften 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.

- Normative Inquiries

- Conceptual Inquiries
- Factual or Descriptive Inquiries

Normative Inquiries:

- How do the obligations of engineers protect the public safety in given situations?
- When should an engineer have to alarm their employers on dangerous practices?
- Where are the laws and organizational procedures that affect engineering practice on moral issues?
- 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.

- What are the reasons on which the engineers show their obligations to their employees or clients or the public ?
-

Conceptual Inquiries:

It is directed to clarify the meaning of concepts or ideas or principles that are expressed by words or by questions and statements For example

- What is the safety and how it is related to risk?
- What does it mean when codes of ethics say engineers should protect the safety, health and welfare of the public?
- What is a ‘bribe’?
- What is a ‘profession’ and ‘professional’?

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

Factual or Descriptive Inquiries:

These help to provide facts for understanding and finding solutions to value based issues. The engineer has to conduct factual inquiries by using scientific techniques. These help to provide information regarding the business realities such as engineering practice, history of engineering profession, the effectiveness of professional societies in imposing moral conduct, the procedures to

be adopted when assessing risks and psychological profiles of engineers. The information about these facts provides understanding and background conditions which create moral problems. These facts are also helpful in solving moral problems by using alternative ways of solutions.

These types of inquiries are said to be complementary and interrelated. Suppose an engineer wants to tell a wrong thing in an engineering practice to his superiors, he has to undergo all these inquiries and prepare an analysis about the problem on the basis of moral values and issues attached to that wrong thing. Then only he can convince his superior. Otherwise his judgment may be neglected or rejected by his superior

MORAL DILEMMAS:

Dilemmas are situations in which moral reasons come into conflict, or in which the application of moral values are problems, and one is not clear of the immediate choice or solution of the problems. Moral reasons could be rights, duties, goods or obligations. These situations do not mean that things had gone wrong, but they only indicate the presence of moral complexity. This makes the decision making complex. For example, a person promised to meet a friend and dine, but he has to help his uncle who is involved in an accident — one has to fix the priority.

There are some difficulties in arriving at the solution to the problems, in dilemma. The three complex situations leading to moral dilemmas are:

1. The problem of vagueness: One is unable to distinguish between good and bad (right or wrong) principle. Good means an action that is obligatory. For example, code of ethics specifies that one should obey the laws and follow standards. Refuse bribe or accept the gift, and maintain confidentiality
2. The problem of conflicting reasons: One is unable to choose between two good moral solutions. One has to fix priority, through knowledge or value system.
3. The problem of disagreement: There may be two or more solutions and none of them mandatory. These solutions may be better or worse in some respects but not in all aspects. One has to interpret, apply different morally reasons, and analyze and rank the decisions. Select the best suitable, under the existing and the most probable conditions.

Steps to Solve Dilemma

The logical steps in confronting moral dilemma are:

1. Identification of the moral factors and reasons. The clarity to identify the relevant moral values from among duties, rights, goods and obligations is obtained (conceptual inquiry). The most useful resource in identifying dilemmas in engineering is the professional codes of ethics, as interpreted by the professional experience. Another resource is talking with colleagues who can focus or narrow down the choice of values.
2. Collection of all information, data, and facts (factual inquiry) relevant to the situation.
3. Rank the moral options i.e., priority in application through value system, and also as obligatory, all right, acceptable, not acceptable, damaging, and most damaging etc. For example, in fulfilling responsibility, the codes give prime importance to public safety and protection of the environment, as compared to the individuals or the employers (conceptual inquiry).
4. Generate alternate courses of action to resolve the dilemma. Write down the main options and sub-options as a matrix or decision tree to ensure that all options are included.
5. Discuss with colleagues and obtain their perspectives, priorities, and suggestions on various alternatives.
6. Decide upon a final course of action, based on priority fixed or assumed. If there is no ideal solution, we arrive at a partially satisfactory or 'satisficing' solution

MORAL AUTONOMY:

Moral autonomy is defined as, decisions and actions exercised on the basis of moral concern for other people and recognition of good moral reasons. Alternatively, moral autonomy means self-determinant or independent. The autonomous people hold moral beliefs and attitudes based on their critical reflection rather than on passive adoption of the conventions of the society or profession. Moral autonomy may also be defined as a skill and habit of thinking rationally about the ethical issues, on the basis of moral concern. Viewing engineering as social experimentation will promote autonomous participation and retain one's professional identity. Periodical performance appraisals, tight-time schedules and fear of foreign competition threatens this autonomy. The attitude of the management should allow latitude in the judgments of their engineers on moral issues. If management views profitability is more important than consistent quality and retention of the customers that discourage the moral autonomy, engineers are compelled to seek the support from their professional societies and outside organizations for moral

support. It appears that the blue-collar workers with the support of the union can adopt better autonomy than the employed professionals. Only recently the legal support has been obtained by the professional societies in exhibiting moral autonomy by professionals in this country. The engineering skills related to moral autonomy is listed as follows:

- Proficiency in recognizing moral problems in engineering and ability to distinguish as well as relate them to problems in law, economics, and religion,
- Skill in comprehending, clarifying, and critically-assessing arguments on different aspects of moral issues,
- Ability to form consistent and comprehensive view points based on facts,
- Awareness of alternate responses to the issues and creative solutions for practical difficulties,
- Sensitivity to genuine difficulties and subtleties, including willingness to undergo and tolerate some uncertainty while making decisions,Using rational dialogue in resolving moral conflicts and developing tolerance of different perspectives among morally reasonable people,Maintaining moral integrity.

Autonomy which is the independence in making decisions and actions is different from authority. Authority provides freedom for action, specified within limits, depending on the situation. Moral autonomy and respect for authority can coexist. They are not against each other. If the authority of the engineer and the moral autonomy of the operator are in conflict, a consensus is obtained by the two, upon discussion and mutual understanding their limits.

MORAL DEVELOPMENT(KOHLBERG'S THEORY):

Moral development in human being occurs overage and experience. Kohlberg suggested there are three levels of moral development, namely pre-conventional, conventional, and post-conventional, based on the type of reasoning and motivation of the individuals in response to moral questions. In the pre-conventional level, right conduct for an individual is regarded as whatever directly benefits oneself. At this level, individuals are motivated by obedience or the desire to avoid punishment or to satisfy their own needs or by the influence by power on them. All young children exhibit this tendency. At the conventional level, people respect the law and authority. Rules and norms of one's family or group or society is accepted, as the standard of

morality. Individuals in this level want to please or satisfy, and get approval by others and to meet the expectations of the society, rather than their self interest (e.g., good students). Loyalty is regarded as most important. Many adults do not go beyond this level.

At the post-conventional level, people are called *autonomous*. They think originally and want to live by universally good principles and welfare of others. They have no self-interest. They live by principled conscience. They follow the golden rule, ‘Do unto others as you would have them do unto you’. They maintain moral integrity, self-respect and respect for others. Kohlberg believed that individuals could only progress through these stages, one stage at a time. He believed that most of the moral development occurs through social interactions.

Gilligan’s Theory Carol Gilligan found that Kohlberg’s theory had a strong male bias. According to Gilligan’s studies, men had a tendency to solve problems by applying abstract moral principles. Men were found to resolve moral dilemma by choosing the most important moral rule, overriding other rules. In contrast, women gave importance to preserve personal relationships with all the people involved. The context oriented emphasis on maintaining personal relationships was called the ethics of care, in contrast with the ethics of rules and rights adopted by men. Gilligan revised the three levels of moral development of Kohlberg, as stages of growth towards ethics of caring. The pre-conventional level, which is same as that of Kohlberg’s first one, right conduct, is viewed in a selfish manner solely as what is good for oneself. The second level called conventional level, the importance is on not hurting others, and willing to sacrifice one’s own interest and help others. This is the characteristic feature of women. At the post-conventional level, a reasoned balance is found between caring about others and pursuing the self-interest. The balance one’s own need and the needs of others, is aimed while maintaining relationship based on mutual caring. This is achieved by context-oriented reasoning, rather than by hierarchy of rules.

CONSENSUS AND CONTROVERSY:

Consensus means agreement‘ and controversy‘ means disagreement. The consensus and the controversies are playing the vital roles while considering the moral autonomy; he may not be able to attain the same results as other people obtain in practicing their moral autonomy. Here there might be some differences in the practical application of moral autonomy. This kind of controversies i.e., disagreements are inevitable. Since exercising moral autonomy is not as precise

and clear-cut as arithmetic, therefore the moral disagreements are natural and common. So in order to allow scope for disagreement, the tolerance is required among individuals with autonomous, reasonable and responsible thinking. According to the principle of tolerance, the objective of teaching and studying engineering ethics is to discover ways of promoting tolerance in the exercise of moral autonomy by engineers.

Thus the goal of teaching engineering ethics is not merely producing always a unanimous moral conformity; it is about finding the proper ways and means for promoting tolerance in the practical applications of moral autonomy by engineers. In a way, the goal of courses on engineering ethics and goals of responsible engineering have some similarities. Both situations require the need for some consensus regarding the role of authority.

Relationship between Autonomy and Authority:

Moral autonomy and respect for authority are compatible with each other. Exercising moral autonomy is based on the moral concern for other people and recognition of good moral reasons. Also moral autonomy emphasizes the capabilities and responsibilities of people. Authority provides the framework through which learning attitudes are encouraged. Sometimes, conflicts will arise between individual need for autonomy and the need for consensus about authority. This situation can be rescued by having open and frank discussion regarding a moral issue with the help of authority. Consider the relationship between autonomy and authority, with reference to a classroom. In the classroom, the teachers have authority over students. Authority of the teachers helps in maintaining the dignity and decorum of academic climate in a institution; also in restoring the confidence and respect between teachers and students. As per the first point, there should be the acceptance of authority of authority by both the teachers and students, in order to conduct the classes in orderly ways. When the authority is misused, conflicts may arise between autonomy and authority. As per the second point, allowing open discussions between teachers and students can reduce the unhealthy academic atmosphere.

MODELS OF PROFESSIONAL ROLES:

It is understood that an engineer has to play many roles while exercising his professional obligations. Some of the professional roles or models are given below:

❖ **Engineers as Saviors**

- It is believed that engineers hold the key for any improvements in society through technological developments. Thus some people consider engineer as a savior because they redeem society from poverty, inefficiency, waste and the hardships drudgery of manual labor.

❖ **Engineers as Guardians**

- Engineers know the direction in which technology should develop and the speed at which it should move. Thus many people agree the role of engineers as guardians, as engineers guard the best interests of society.

❖ **Engineers as Bureaucratic Servants**

- The engineer's role in the management is to be the servant who receives and translates the directives of management into solid accomplishments.
- Thus the engineers act as a bureaucratic servants i.e., loyal organizations set by the management.

❖ **Engineers as Social Servants**

- As we know, engineers have to play the role of social servants to receive society's directives and to satisfy society's desires.

❖ **Engineers as Social Enablers and Catalysts**

- Besides merely practising the management's directives, the engineers have to play a role of creating a better society. Also they should act as catalysts for making social changes.
- Sometimes engineers have to help the management and the society to understand their needs and to make decisions about desirable technological development.

❖ **Engineers as Game Players**

- In actual practice, engineers are neither servants nor masters of anyone. In fact, they play the economic game rules, which may be effective at a given time.

Like managers, the engineers aim is also to play successfully within the organization and moving ahead in a competitive world.

RESPONSIBILITY

Senses

There are different senses of responsibility, such as:

1. Characteristic Quality

Primarily responsibility implies duty with care and efforts.

2. Obligations

These are one's moral responsibility i.e., duty to act right and in moral ways. The obligations such as honesty, fairness, and decency are incumbent on every one. In addition to this, we have role responsibilities

assigned by taking up various roles, such as parents, inspectors, and employees. For example, a Safety Engineer has a responsibility to make regular inspections in a factory shops.

3. General Moral Capacity

One has the general capacity for moral agency, including the understanding and action on moral reasons.

4. Liability and Accountability

Liability and Accountability for actions. It means that one is liable (with a legal sense) to meet the obligations in better ways. The person is likely to respond legally, if necessary.

Accountable means that one is willing to justify or defend the decisions, actions or means and outcomes. It could include offering a reasonable excuse or accepting the shame for not having met the end results or accepting the guilt for harming others. One is also answerable to the assessment by others on one's actions (means) or outcomes.

5. Praiseworthiness/Blameworthiness

When accountability for wrong actions or results is at issue, responsibility means blameworthy. When the right conduct or successful result is at issue, responsible is synonymous with praiseworthy

Types

Different types of responsibilities exhibited in human transactions are:

1. Moral Responsibility

Moral responsibility as applied to a professional: A professional must be responsible morally, in creating internal good or good outcomes, and eliminating /minimizing un-intended side-effects, from engineering and technology. It includes:

(a) Obligations: A commitment to moral actions (primary obligation to protect the safety of the human beings and respect their rights),

(b) Conscientious: A comprehensive perspective to accept the duties, and diligently do the right things by putting their heart, head and hands (awareness of the experimental nature of the product/project, anticipating possible and unexpected outcomes and putting efforts to monitor them),

(c) Accountability (being accountable for the decisions, actions, and the results of product/project including safety), and

(d) Praiseworthy/Blameworthy as applied to context of doing things right/doing things wrongly, respectively.

Responsible Professionalism

The most comprehensive virtue of engineers is responsible professionalism. It can also be called Professional Responsibility.

1. Self-direction (Self-governance) virtues are fundamental and necessary in exercising moral responsibility. On the basis of 'understanding and cognition', it includes self-understanding, humility (proper assessment of one's character), and good moral judgment (termed as 'practical wisdom' by Aristotle). On the basis of 'commitment and action', it covers courage, self discipline, perseverance, self-respect, and integrity. Honesty a virtue common to both bases as it implies truthfulness in thoughts and words and trustworthiness in actions.

2. Public-spirited virtues focus on the good of the clients and the public. It includes the respect for rights (to make decisions and face the risk), non-maleficence (not harming others intentionally). Engineering codes go a step further and prescribe beneficence that includes preventing or removing harm to others and also promoting the public safety, health, and welfare, generosity (helping the community by voluntarily giving their time, talent, and money-voluntary service to the professional society and community), and justice (unbiased) in all decisions and actions.

3. Team-work virtues enable the professionals to work successfully with others. They include collegiality, cooperativeness, communicative ability, and respect for legitimate authority. Responsible exercise of authority and the ability to motivate other to achieve are also the relevant to team-work

virtues.

4. Proficiency virtues, which mean the mastery of technical skills (called as Intellectual Virtue by Aristotle). It includes competence (having qualified, licensed, and prepared to execute the job that is undertaken), diligence (alert to dangers, careful attention, and avoidance of laziness or workaholic nature), creativity (learning to respond to the changing technological society), excellence (perform at the highest level), and self-renewal through continuing education.

THEORIES ABOUT RIGHT ACTION:

The main objectives of right action are;

- To understand the distinction between a theory of Right and a theory of Good.
- To understand Utilitarianism, Ethical Egoism, and Consequentialism
- To Know how rule utilitarianism differs from act utilitarianism;

—Utilitarianism is the moral philosophy putting that at the center of things. It concentrates upon general well-wishing or benevolence, or solidarity or identification with the pleasure and pain or welfare of people as a whole. The good is identified with the greatest happiness of the greatest number, and the aim of action is to advance the good (this is known as the principle of Utility). We should always do whatever will produce the greatest possible balance of happiness over unhappiness for everyone who will be affected by our action. Utilitarianism is often summed up as doing _the greatest good for the greatest number.||

Theories of Rights Action are philosophical concepts concerned with human nature and their rights and duties to lead the life with ethical values. The concepts mainly focus on individual person's actions and their consequences. There are different versions of rights action introduced by difference ethicists during the eighteen-century Enlightenment Era: utilitarianism; rights ethics, and duty.

Our task here is to define the concept of Rights Action. We may have different perspectives and understanding of the concepts. After having learnt the concepts: utilitarianism; liberty rights; welfare rights; and duty ethics we can theorize the concept of Right Action as the followings:

- Right action is the action which controls by law
- Right action considers to good consequences of action
- Right action is the action which is benefits to all students, teachers, society, industry etc.
- Right action is the consequences of action that is not violate the moral rule.

Other definitions: a right action is an act that is permissible for you to do. It may be either: a). an obligation act- is one that morality requires you to do, b). an optional act- an act not obligatory or wrong to do; it is not your duty.

SELF-INTEREST:

Self-interest is being good and acceptable to oneself. It is pursuing what is good for oneself. It is very ethical to possess self-interest. As per utilitarian theory, this interest should provide for the respect of others also. Duty ethics recognizes this aspect as duties to ourselves. Then only one can help others. Right ethicist stresses our rights to pursue our own good. Virtue ethics also accepts the importance of self-respect as link to social practices.

In Ethical Egoism, the self is conceived in a highly individualistic manner. It says that every one of us should always and only promote one's own interest. The ethical egoists do not accept the well-being of the community or caring for others. However this self-interest should not degenerate into egoism or selfishness, i.e., maximizing only own good in the pursuit of self-interest. The ethical egoists hold that the society benefits to maximum when (a) the individuals pursue their personal good and (b) the individual organizations pursue maximum profit in a competitive enterprise. This is claimed to improve the economy of the country as a whole, besides the individuals. In such pursuits, both individuals and organizations should realize that independence is not the only important value. We are also interdependent, as much as independent. Each of us is vulnerable in the society. Self-respect includes recognition of our vulnerabilities and interdependencies. Hence, it is compatible with caring for ourselves as well as others. Self-interest is necessary initially to begin with. But it should be one of the prime motives for action; the other motive is to show concern for others, in the family as well as society. One's self-interest should not harm others. The principles of 'Live and let (others) live', and 'reasonably fair competition' are recommended to professionals by the ethicists

CUSTOMS AND RELIGION:

As we live in a society which is of increasingly diverse nature, it is more important to have tolerance for various customs and outlooks. Hence the concept of ethical pluralism emerges. It views that there may be alternative moral attitudes that are reasonable. But none of the moral perspectives can be accepted completely by all the rational and the morally concerned persons. Ethical pluralism allows the customs which plays an important role in deciding how we should act. Moral values are many, varied and flexible. So, these moral values allow considerable variation in how different individuals and groups understand and apply them in their day-to-day activities. In other words, to be precise, reasonable persons always have reasonable disagreement on moral issues, including issues in engineering ethics. Ethical Relativism, an objectionable view, should not be confused with Ethical Pluralism. As per Ethical relativism says that actions are morally right when they are approved by law or custom and they are said to be wrong when they violate laws or customs. Ethical relativism tries to reduce moral values to laws, conventions and customs of societies.

What is the necessary for a person to accept ethical relativism? There are so many reasons for accepting ethical relativism –

The laws and customs seem to be definite, real and clear – cut. They help to reduce the endless disputes about right and wrong. Moreover, laws seem to be an objective way to approach values. The above argument is somewhat weak. This reason underestimates the extent to which ordinary moral reasons are sufficiently objective to make possible criticism of individual prejudice and bias.

Moreover, moral reasons allow objective criticism of the given laws as morally inadequate. The second reason for accepting ethical relativism is because it believes the values are subjective at the cultural level. They also state that the moral standards are varied from one culture to another. The only kind of objectivity is relative to a given set of laws in a given society. This relativity of morality encourages the virtue of tolerance of difference among societies.

USES OF ETHICAL THEORIES:

Ethical theories have so many uses. Out of them, the following three are the most important uses:

- Understanding moral dilemmas.
- Justifying professional obligations and ideas.
- Relating ordinary and professional morality.

Global Issues

Globalization

Globalization means integration of countries through commerce, transfer of technology, and exchange of information and culture. In a way, it includes acting together and interacting economies through trade, investment, loan, development schemes and capital across countries. In a different sense, these flows include knowledge, science, technology, skills, culture, information, and entertainment, besides direct human resource, tele-work, and outsourcing. This interdependence has increased the complex tensions and ruptures among the nations. For the engineers, the issues such as multinational organizations, computer, internet functions, military development and environmental ethics have assumed greater importance for their very sustenance and progress.

Multinational corporations

Organizations who have established business in more than one country, are called multinational corporation. The headquarters are in the home country and the business is extended in many host countries. The Western organizations doing business in the less-economically developed (developing, and overpopulated) countries gain the advantage of inexpensive labor, availability of natural resources, conducive-tax atmosphere, and virgin market for the products. At the same time, the developing countries are also benefited by fresh job opportunities, jobs with higher remuneration and challenges, transfer of technology, and several social benefits by the wealth developed. But this happens invariably with some social and cultural disturbance. Loss of jobs for the home country, and loss or exploitation of natural resources, political instability for the host countries are some of the threats of globalization.

International Human Rights

To know what are the moral responsibilities and obligations of the multinational corporations operating in the host countries, let us discuss with the framework of rights ethics. Common

minimal rights are to be followed to smoothen the transactions when the engineers and employers of MNCs have to interact at official, social, economic and sometimes political levels. At international level, the organizations are expected to adopt the minimum levels of

- (a) values, such as mutual support, loyalty, and reciprocity,
- (b) the negative duty of refraining from harmful actions such as violence and fraud, and
- (c) basic fairness and practical justice in case of conflicts.

The ten international rights to be taken care of, in this context are:

1. Right of freedom of physical movement of people
2. Right of ownership of properties
3. Freedom from torture
4. Right to fair trial on the products
5. Freedom from discrimination on the basis of race or sex. If such discrimination against women or minorities is prevalent in the host country, the MNC will be compelled to accept. MNCs may opt to quit that country if the human rights violations are severe.
6. Physical security. Use of safety gadgets have to be supplied to the workers even if the laws of the host country do not suggest such measures.
7. Freedom of speech and forming association
8. Right to have a minimum education
9. Right to political participation
10. Right to live and exist (i.e., coexistence). The individual liberty and sanctity of the human life are to be respected by all societies.

Technology Transfer

It is a process of moving technology to a new setting and implementing it there. Technology includes hardware (machines and installations) and the techniques (technical, organizational, and managerial skills and procedures). It may mean moving the technology applications from laboratory to the field/factory or from one country to another. This transfer is effected by governments, organizations, universities, and MNCs.

Appropriate Technology

Identification, transfer, and implementation of most suitable technology for a set of new situations, is called appropriate technology. Technology includes both hardware (machines and installations) and software (technical, organizational and managerial skills and procedures).

Factors such as economic, social, and engineering constraints are the causes for the modification of technology. Depending on the availability of resources, physical conditions (such as temperature, humidity, salinity, geographical location, isolated land area, and availability of water), capital opportunity costs, and the human value system (social acceptability) which includes their traditions, beliefs, and religion, the appropriateness is to be determined.

For example, small farmers in our country prefer to own and use the power tillers, rather than the high-powered tractors or sophisticated harvesting machines. On the other hand, the latest technological device, the cell phones and wireless local loop phones have found their way into remote villages and hamlets, than the landline telephone connections. Large aqua-culture farms should not make the existing fishermen jobless in their own village. The term appropriate is value based and it should ensure fulfillment of the human needs and protection of the environment.

Environmental ethics

Environmental ethics is the study of (a) moral issues concerning the environment, and (b) moral perspectives, beliefs, or attitudes concerning those issues. Engineers in the past are known for their negligence of environment, in their activities. It has become important now that engineers design eco-friendly tools, machines, sustainable products, processes, and projects. These are essential now to (a) ensure protection (safety) of environment (b) prevent the degradation of environment, and (c) slow down the exploitation of the natural resources, so that the future generation can survive.

The American Society of Civil Engineers (ASCE) code of ethics, has specifically requires that “engineers shall hold paramount the safety, health, and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of professional duties” The term sustainable development emphasizes on the investment, orientation of technology, development and functioning of organizations to meet the present needs of people and at the same time ensuring the future generations to meet their needs.

Engineers as experimenters have certain duties towards environmental ethics, namely:

1. Environmental impact assessment: One major but sure and unintended effect of technology is wastage and the resulting pollution of land, water, air and even space. Study how the industry and technology affects the environment.
2. Establish standards: Study and to fix the tolerable and actual pollution levels.
3. Counter measures: Study what the protective or eliminating measures are available for immediate implementation

Disasters

1. Plastic Waste Disposal

In our country, several crores of plastic bottles are used as containers for water and oil, and plastic bags are used to pack different materials ranging from vegetables to gold ornaments. Hardly any of these are recycled. They end up in gutters, roadsides, and agricultural fields. In all these destinations, they created havoc. The worse still is the burning of plastic materials in streets and camphor along with plastic cover in temples, since they release toxic fumes and threaten seriously the air quality. Cities and local administration have to act on this, collect and arrange for recycling through industries.

e-Waste Disposal

The parts of computers and electronic devices which have served its useful life present a major environmental issue for all the developing countries including India. This scrap contains highly toxic elements such as lead, cadmium, and mercury.

Industrial Waste Disposal

There has been a lot of complaints through the media, on (a) against the Sterlite Copper Smelting Plant in Thuthukkudi (1997) against its pollution, and (b) when Indian companies imported the discarded French Warship Clemenceau for disposal, the poisonous asbestos compounds were expected to pollute the atmosphere besides exposing the labor to a great risk, during the disposal. ia, Japan, South Korea and US met in California in April 2006 for the first working session of the Asia- Pacific Partnership on Clean Development and Climate. These six countries account for about half of the world's emissions of climate-heating greenhouse gases. Only one of the six, Japan, is committed to reducing greenhouse gas emissions by at

least 5.2 per cent below 1990 levels by 2012 under the Kyoto Agreement. About 190 nations met in Germany in the middle of May 2006 and tried to bridge vast policy gaps between the United States and its main allies over how to combat climate change amid growing evidence that the world is warming that could wreak havoc by stoking more droughts, heat waves, floods, more powerful storms and raise global sea levels by almost a meter by 2100.

Depletion of Ozone Layer

The ozone layer protects the entire planet from the ill-effects of ultraviolet radiation and is vital for all living organisms in this world. But it is eaten away by the Chloro-fluro-carbons (CFC) such as freon emanating from the refrigerators, air conditioners, and aerosol can spray. This has caused also skin cancer to sun-bathers in the Western countries. Further NO and NO₂ gases were also found to react with the ozone. Apart from engineers, the organizations, laws of the country and local administration and market mechanisms are required to take up concerted efforts to protect the environment.

Global Warming

Over the past 30 years, the Earth has warmed by 0.6 °C. Over the last 100 years, it has warmed by 0.8 °C. It is likely to push up temperature by 3 oC by 2100, according to NASA's studies. The U.S. administration has accepted the reality of global climate change, which has been associated with stronger hurricanes, severe droughts, intense heat waves and the melting of polar ice. Greenhouse gases, notably carbon dioxide emitted by motor vehicles and coal-fired power plants, trap heat like the glass walls of a greenhouse, cause the Earth to warm up. Delegates from the six countries — Australia, China, India, bridge vast policy gaps between the United States and its main allies over how to combat climate change amid growing evidence that the world is warming that could wreak havoc by stoking more droughts, heat waves, floods, more powerful storms and raise global sea levels by almost a meter by 2100.

Acid Rain

Large emissions of sulphur oxides and nitrous oxides are being released in to the air from the thermal power stations using the fossil fuels, and several processing industries. These gases form compounds with water in the air and precipitates as rain or snow on to the earth. The acid

rain in some parts of the world has caused sufficient damage to the fertility of the land and to the human beings. Human-centered Environmental Ethics This approach assumes that only human beings have inherent moral worth duly to be taken care of. Other living being and ecosystems are only instrumental in nature. Utilitarianism aims to maximize good consequences for human beings. Most of the goods are engineered products made out of natural resources. Human beings have also (a) recreational interests (enjoy leisure through mountaineering, sports, and pastimes), (b) aesthetic interests (enjoy nature as from seeing waterfalls and snow-clad mountains), (c) scientific interests to explore into nature or processes, and (d) a basic interest to survive, by preservation as well as conservation of nature and natural resources. Rights ethicists favor the basic rights to live and right to liberty, to realise the right to a live in a supportive environment. Further, virtue ethics stresses importance of prudence, humility, appreciation of natural beauty, and gratitude to the mother nature that provides everything. However, the nature-centered ethics, which ensures the worth of all living beings and organisms, seems to be more appropriate in the present-day context. Many Asian religions stress the unity with nature, rather than domination and exploitation. The Zen Buddhism calls for a simple life with compassion towards humans and other animals. Hinduism enshrines the ideal of oneness (advaita) inand principle of ahimsa to all living beings. It identifies all the human beings, animals, and plants as divine. The eco-balance is the need of the hour and the engineers are the right experimenters to achieve this.

Environmental awareness: Study on how to educate the people on environmental practices, issues, and possible remedies.

Computer ethics

Computer ethics is defined as (a) study and analysis of nature and social impact of computer technology,(b) formulation and justification of policies, for ethical use of computers. This subject has become relevant to the professionals such as designers of computers, programmers, system analysts, system managers, and operators. The use of computers have raised a host of moral concerns such as free speech, privacy, intellectual property right, and physical as well as mental harm. There appears to be no conceptual framework available on ethics, to study and understand and resolve the problems in computer technology.

Types of Issues

Different types of problems are found in computer ethics.

1. Computer as the Instrument of Unethical Acts

(a) The usage of computer replaces the job positions. This has been overcome to a large extent by re adjusting work assignments, and training everyone on computer applications such as word processing, editing, and graphics.

(b) Breaking privacy. Information or data of the individuals accessed or erased or the ownership changed.

(c) Defraud a bank or a client, by accessing and withdrawing money from other's bank account.

Weapons development

Military activities including the world wars have stimulated the growth of technology. The growth of Internet amply illustrates this fact. The development of warfare and the involvement of engineers bring out many ethical issues concerned with engineers, such as the issue of integrity in experiments as well as expenditure in defense research and development, issue of personal commitment and conscience, and the issues of social justice and social health.

ENGINEERS AS MANAGERS

Characteristics

The characteristics of engineers as managers are:

1. Promote an ethical climate, through framing organization policies, responsibilities and by personal attitudes and obligations.
2. Resolving conflicts, by evolving priority, developing mutual understanding, generating various alternative solutions to problems.
3. Social responsibility to stakeholders, customers and employers. They act to develop wealth as well as the welfare of the society. Ethicists project the view that the manager's responsibility is only to increase the profit of the organization, and only the engineers have the responsibility to protect the safety, health, and welfare of the public. But managers have the ethical responsibility to produce safe and good products (or useful service), while showing respect for the human beings who include the employees, customers and the public. Hence, the

objective for the managers and engineers is to produce valuable products that are also profitable.

Managing Conflicts

In solving conflicts, force should not be resorted. In fact, the conflict situations should be tolerated, understood, and resolved by participation by all the concerned. The conflicts in case of project managers arise in the following manners:

- (a) Conflicts based on schedules: This happens because of various levels of execution, priority and limitations of each level.
- (b) Conflicts arising out of fixing the priority to different projects or departments. This is to be arrived at from the end requirements and it may change from time to time.
- (c) Conflict based on the availability of personnel.
- (d) Conflict over technical, economic, and time factors such as cost, time, and performance level.
- (e) Conflict arising in administration such as authority, responsibility, accountability, and logistics required.
- (f) Conflicts of personality, human psychology and ego problems.
- (g) Conflict over expenditure and its deviations.

Most of the conflicts can be resolved by following the principles listed here:

1. People

Separate people from the problem. It implies that the views of all concerned should be obtained. The questions such as what, why, and when the error was committed is more important than to know who committed it. This impersonal approach will lead to not only early solution but also others will be prevented from committing errors.

2. Interests

Focus must be only on interest i.e., the ethical attitudes or motives and not on the positions (i.e., stated views). A supplier may require commission larger than usual prevailing rate for an agricultural product. But the past analysis may tell us that the material is not cultivated regularly and the monsoon poses some additional risk towards the supply. Mutual interests must be respected to a maximum level. What is right is more important than who is right!

3. Options

Generate various options as solutions to the problem. This helps a manager to try the next best solution should the first one fails. Decision on alternate solutions can be taken more easily and without loss of time.

4. Evaluation

The evaluation of the results should be based on some specified objectives such as efficiency, quality, and customer satisfaction. More important is that the means, not only the goals, should be ethical.

CONSULTING ENGINEERS

The consulting engineers work in private. There is no salary from the employers. But they charge fees from the sponsor and they have more freedom to decide on their projects. Still they have no absolute freedom, because they need to earn for their living. The consulting engineers have ethical responsibilities different from the salaried engineers, as follows:

1. Advertising

The consulting engineers are directly responsible for advertising their services, even if they employ other consultants to assist them. But in many organisations, this responsibility is with the advertising executives and the personnel department.

They are allowed to advertise but to avoid deceptive ones.

Deceptive advertising such as the following are prohibited:

- (a) By white lies.
- (b) Half-truth, e.g., a product has actually been tested as prototype, but it was claimed to have been already introduced in the market. An architect shows the photograph of the completed building with flowering trees around but actually the foundation of the building has been completed and there is no real garden.
- (c) Exaggerated claims. The consultant might have played a small role in a well-known project. But they could claim to have played a major role.
- (d) Making false suggestions. The reduction in cost might have been achieved along with the reduction in strength, but the strength details are hidden.
- (e) Through vague wordings or slogans.

2. Competitive Bidding

It means offering a price, and get something in return for the service offered. The organizations have a pool of engineers. The expertise can be shared and the bidding is made more realistic. But the individual consultants have to develop creative designs and build their reputation steadily and carefully, over a period of time. The clients will have to choose between the reputed organizations and proven qualifications of the company and the expertise of the consultants. Although competent, the younger consultants are thus slightly at a disadvantage.

3. Contingency Fee

This is the fee or commission paid to the consultant, when one is successful in saving the expenses for the client. A sense of honesty and fairness is required in fixing this fee. The NSPE Code III 6 (a) says that the engineers shall not propose or accept a commission on a contingent basis where their judgment may be compromised.

The fee may be either as an agreed amount or a fixed percentage of the savings realized. But in the contingency fee-agreements, the judgment of the consultant may be biased. The consultant may be tempted to specify inferior materials or design methods to cut the construction cost. This fee may motivate the consultants to effect saving in the costs to the clients, through reasonably moral

4. Safety and Client's Needs

The greater freedom for the consulting engineers in decision making on safety aspects, and difficulties concerning truthfulness are the matters to be given attention. For example, in design-only projects, the consulting engineers may design something and have no role in the construction. Sometimes, difficulties may crop-up during construction due to non-availability of suitable materials, some shortcuts in construction, and lack of necessary and adequate supervision and inspection. Properly-trained supervision is needed, but may not happen, unless it is provided. Further, the contractor may not understand and/or be willing to modify the original design to serve the clients best. A few on-site inspections by the consulting engineers will expose the deficiency in execution and save the workers, the public, and the environment that may be exposed to risk upon completion of the project

Engineers involved in weapons development because of the following reasons:

1. It gives one job with high salary.
2. One takes pride and honor in participating in the activities towards the defense of the nation (patriotic fervor).
3. One believes the he fights a war on terrorism and thereby contribute to peace and stability of the country. Ironically, the wars have never won peace, only peace can win peace!
4. By research and development, the engineer is reducing or eliminating the risk from enemy weapons, and saving one's country from disaster.
5. By building-up arsenals and show of force, a country can force the rogue country, towards regulation. Engineers can participate effectively in arms control negotiations for surrender or peace, e.g., bombing of Nagasaki and Hiroshima led to surrender by the Japanese in 1945. Many engineers had to fight and convince their personal conscience. The scene such as that of a Vietnamese village girl running wild with burns on the body and horror in the face and curse in her mind has moved some engineers away from their jobs.

Engineers as expert witness

Frequently engineers are required to act as consultants and provide expert opinion and views in many legal cases of the past events. They are required to explain the causes of accidents, malfunctions and other technological behavior of structures, machines, and instruments, e.g., personal injury while using an instrument, defective product, traffic accident, structure or building collapse, and damage to the property, are some of the cases where testimonies are needed.

Engineers as advisors in planning and policy making

Advisors

The engineers are required to give their view on the future such as in planning, policy-making, which involves the technology. For example, should India expand nuclear power options or support traditional energy sources such as fossil fuels or alternative forms like solar and wind energy? In the recent past, this topic has created lot of fireworks, in the national media.

1. Objectivity

The engineers should study the cost and benefits of all possible alternative means in objective manner, within the specified conditions and assumptions.

2. Study All Aspects

They have to study the economic viability (effectiveness), technical feasibility (efficiency), operational feasibility (skills) and social acceptability, which include environmental and ethical aspects, before formulating the policy.

3. Values

Engineers have to possess the qualities, such as (a) honesty, (b) competence (skills and expertise), (c) diligence (careful and alert) (d) loyalty in serving the interests of the clients and maintaining confidentiality, and (e) public trust, and respect for the common good, rather than serving only the interests of the clients or the political interests.

4. Technical Complexity

The arbitrary, unrealistic, and controversial assumptions made during the future planning that are overlooked or not verified, will lead to moral complexity. The study on future is full of uncertainties than the investigations on the past events. On the study of energy options, for example, assumptions on population increase, life style, urbanization, availability of local fossil resources, projected costs of generating alternative forms of energy, world political scenario, world military tensions and pressures from world organizations such as World Trade Organisation (W.T.O.) and European Union (EU) may increase the complexity in judgment on future.

5. National Security

The proposed options should be aimed to strengthen the economy and security of the nation, besides safeguarding the natural resources and the environment from exploitation and degradation. For the advisors on policy making or planning, a shared understanding on balancing the conflicting responsibilities, both to the clients and to the public, can be effected by the following roles or models:

1. Hired Gun

The prime obligation is shown to the clients. The data and facts favorable to the clients are highlighted, and unfavorable aspects are hidden or treated as insignificant. The minimal level

of interest is shown for public welfare.

2. Value-neutral Analysts

This assumes an impartial engineer. They exhibit conscientious decisions, impartiality i.e., without bias, fear or favor, and absence of advocacy.

Value-guided Advocates

The consulting engineers remain honest (frank in stating all the relevant facts and truthful in interpretation of the facts) and autonomous (independent) in judgement and show paramount importance to the public (as different from the hired guns).

Codes of ethics

National Society of Professional Engineers

Preamble

Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the higher standards of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of then public health, safety, and welfare. Engineer must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

I Fundamental Canons

Engineers in the fulfillment of their professional duties shall

1. hold paramount the safety, health, and welfare of the public.
2. perform services only in areas of their competence.
3. issue public statements only in objective and truthful manner.
4. act for each employer or client as faithful agents or trustees.
5. avoid deceptive acts.
6. conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

II Rules of Practice

1. Engineers shall hold paramount the safety, health, and welfare of the public.

(a) If engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.

Engineers shall approve only those engineering documents that are in conformity with applicable standards.

(c) Engineers shall not reveal facts, data, or information without prior consent of the client or employer except as authorized or required by law or this code.

(d) Engineers shall not permit the use of their name or associate in business ventures with any person or firm that they believe are engaged in fraudulent or dishonest enterprise.

(e) Engineers shall not aid or abet the unlawful practice of engineering by a person or firm.

(f) Engineers having knowledge of any alleged violation of this Code shall report there on to appropriate professional bodies and when relevant, also to public authorities, and cooperate with the proper authorities in furnishing such information or assistance as may be required.

2. Engineers shall perform services only in the areas of their competence.

(a) Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved.

(b) Engineers shall not affix their signatures to any plans or documents dealing with the subject matter in which they lack competence, nor to any plan or document not prepared under their direction and control.

(c) Engineers may accept assignments and assume responsibility for coordination of an entire project and sign and seal the engineering documents for the entire project, provided that each technical segment is signed and sealed only by the qualified engineers who prepared the segment.

3. Engineers shall issue public statements only in an objective and truthful manner.

(a) Engineers shall be objective and truthful in professional reports, statements, or testimony.

They shall include all relevant and pertinent information in such reports, statements, for testimony, which should bear the date indicating when it was current.

(b) Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence in the subject matter.

(c) Engineers shall issue no statements, criticisms, or arguments on technical matters that are inspired or paid for by interested parties on prefaced their comments by explicitly identifying the interested parties on whose behalf they are speaking and by revealing the existence of any interest the engineers may have in the matters.

4. Engineers shall at for each employer or client as faithful agents or trustees

(a) Engineers shall disclose all known or potential conflicts of interest that could influence or appear to influence their judgment or the quality of their services.

(b) Engineers shall not accept compensation, financial or otherwise, from more than one party for services on the same project, or for services pertaining to the same project, unless the circumstances are fully disclosed and agreed to by all interested parties.

(c) Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents on connection with the work for which they are responsible.

(d) Engineers in public service as members, advisers, or employees of a governmental or quasi-governmental body or department shall not participate in decisions with respect to services solicited or provided by them or their organizations in private or public engineering practice.

(e) Engineers shall not solicit or accept a contract from a governmental body on which a principal or officer of their organization serves as a member.

5. Engineers shall avoid deceptive acts (a) Engineers shall not falsify their qualifications or permit misrepresentation of their or their associate's qualifications. They shall not misrepresent or exaggerate their responsibility in or for the subject matter of prior assignments. Brochures or other presentations incident to the solicitation of employment shall not misrepresent pertinent facts concerning employers, employees, associates, joint ventures, or past accomplishments.

(b) Engineers shall not offer, give, solicit or receive, either directly or indirectly, any contribution to influence the award of a contract by public authority, or which may be reasonably construed by the public as having the effect of intent to influence the awarding of a contract. They shall not offer any gift or other valuable consideration in order to secure work. They shall not pay a commission, percentage, or brokerage fee in order to secure work, except

to a bona fide employee or established commercial or marketing agencies retained by them.

The Institute of Electrical & Electronics Engineers

Code of Ethics

The members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

1. To accept responsibility in making engineering decisions consistent with the safety, health and welfare of the public, and to disclose prompt factors that might endanger the public or the environment.
2. To avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist.
3. To be honest and realistic in stating claims or estimates based on available data.
4. To reject bribery in all its forms.
5. To improve the understanding of technology, its appropriate application, and potential consequences.
6. To maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations.
7. To seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others.
8. To treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin.
9. To avoid injuring others, their property, reputation, or employment by false or malicious action.
10. To assist colleagues and co-workers in their professional development and to support them in following code of ethics.

Engineering council of India

Engineering Council of India was formed in 2002 with one of its objectives as “to establish a common code of ethics for professional and consulting engineers for adoption by Associations/Professional Societies and to evolve the strategy for its enforcement.” The IET, IETE, and Consulting Engineers Association of India (CEAI), AICTE, and NBA are the members of this council.