

**GE6075 – Professional Ethics in Engineering**

**UNIT- 5 Global Issues**

# UNIT- 5 Globalization

## GLOBALIZATION

- ▶ Globalization means **integration of countries** through **commerce, transfer of technology**, and exchange of information and culture.
- ▶ Acting together and interacting economies through **trade, investment, loan, development schemes and capital across countries**.
- ▶ Flow of **knowledge, science, technology, skills, culture, information, and entertainment**, besides direct human resource, tele-work, and outsourcing.

# UNIT- 5 Globalization

## KEY CONCEPTS

- Multinational corporations:** corporations doing extensive business in more than one country, including their official “home country” and additional “host countries.”
- Globalization:** increasing integration of nations through trade, investment, transfer of technology, and exchange of ideas and culture.
- Technology transfer:** the process of moving technology to a novel setting and implementing it there.
- Appropriate technology:** the identification, transfer, and implementation of the most suitable technology for a new set of conditions.
- Intermediate technology:** technology lying between the most advanced forms available in industrialized countries and comparatively primitive forms in less-developed countries.

# UNIT- 5 Terminologies

- Ethical relativism:** the view that actions are morally right within a particular society when (and only because) they are approved by law, custom, or other conventions of that society.
- Ethical absolutism:** the view that moral principles have no justified exceptions and that what is morally true in one situation is true everywhere else.
- Ethical relationalism** (or contextualism): the view that moral judgments are and should be made in relation to factors that vary from situation to situation, usually making it impossible to formulate rules that are both simple and absolute (exceptionless).
- Ethical pluralism:** the view that there can be more than one justifiable moral perspective.
- Computer ethics:** the study of moral issues concerning computers and the Internet, including issues about free speech, privacy, respect for property, informed consent, and harm.
- Computer abuse:** unethical or illegal conduct in which computers play a central role, whether as instruments or as objects.
- Weapons development ethics:** includes issues about integrity in expenditures in the defense industry, issues connected with personal commitments and conscience of individual engineers, and wider issues about justice and humanity.

# UNIT- 5 Global Issues – Multinational Corporations

- ▶ Organisations 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.
- ▶ **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.**

# UNIT-5

## International Human Rights

### International Human Rights

**Moral responsibilities and obligations of the multinational corporations operating in the host countries,**

- 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.*

# UNIT-5 International Human Rights

**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.**

# UNIT-5 Technology Transfer

## 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.

# UNIT-5 Appropriate Technology

## 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.**

# UNIT-5 MNC and Morality

## MNCs and Morality

- ❑ The economic and environmental conditions of the home and host countries may vary. The multinational institutions have to adopt appropriate measures not to disturb or dislocate the social and living conditions and cultures of the home countries. A few principles are enlisted here:
- ❑ 1. MNC should respect the basic human rights of the people of the host countries.
- ❑ 2. The activities of the MNC should give economic and transfer technical benefits, and implement welfare measures of the workers of the host countries.
- ❑ 3. The business practices of the multinational organisations should improve and promote morally justified institutions in the host countries.
- ❑ 4. The multinationals must respect the laws and political set up, besides cultures and promote the cultures of the host countries.
- ❑ 5. The multinational organisations should provide a fair remuneration to the employees of the host countries. If the remuneration is high as that of home country, this may create tensions and if it is too low it will lead to exploitation.
- ❑ 6. Multinational institutions should provide necessary safety for the workers when they are engaged in hazardous activities and 'informed consent' should be obtained from them.
- ❑ Adequate compensation should be paid to them for the additional risks undertaken.

# UNIT-5 Bhopal Gas Tragedy

## Case Study: Bhopal Gas Tragedy

- ❑ **The Union Carbide had 51% and the Indian subsidiary UC India Ltd. had 49% of stock.**
- ❑ **In 1983, there were 14 plants in India manufacturing chemicals, pesticides, and other hazardous products.**
- ❑ **The Bhopal plant had a license to make Methyl isocyanate-based pesticides.**
- ❑ **In November 1984, they had decided to close down the plant.**
- ❑ **For quite some years before the production rate was going down.**

## UNIT-5 Bhopal Gas Tragedy

The cumulative effects of the following factors caused the tragedy in Bhopal on December 3, 1984.

1. **Maintenance neglected** & the trained maintenance **reduced** as **economy measure**.
2. **Inadequate training** of the personnel to handle **emergencies**.
3. **Periodical Safety Inspection teams** from U.S. which visited previously were also **stopped**.
  - ❑ The procedures had been **deteriorating at these sites for weeks or months**, prior to the accident.
  - ❑ There was clear **lack of management systems & procedures to ensure safety**.
4. **Vital spares** for equipments and machineries were **not available**
5. Absence of capital replacement led to the stagnant economy of the plant.
6. The **high turnover of the experienced engineers and technicians**, who were demoralized by the lack of development.
7. **Lack of experienced personnel to operate and control** the vital installations.
8. They have **not conducted** a thorough **process hazards analysis** that would have **exposed the serious hazards** which resulted in disaster later.
9. **No emergency plan was put in practice**, during the shut down and maintenance.
10. Above all, the **commitment of top-level management** to safety was **lacking**.

# UNIT-5 Bhopal Gas Tragedy

Technologically, the tragedy was caused by a **series of events** listed:

1. The safety manual of U C prescribed that the **MIC tanks** were to be filled only up to 60% of the capacity. **But the tanks were reported to have been filled up to 75%.**
2. The safety policy prescribed that an empty tank should be available as a stand-by in case of emergency. But the emergency tank was also filled with to its full capacity. These facts confirmed that the **MNC had not followed and implemented appropriate safety standards of the home country in the host country.** [Example of 'misappropriate technology'?]
3. **The storage tanks should be refrigerated to make the chemical less reactive.** But here the **refrigeration system was shut down as an economy measure.** This raised the temperature of the gas stored.
4. The plant was shut down for maintenance two months earlier. The worker who cleaned the pipes and filters connected to the tanks and closed the valves, was not trained properly. He did not insert the safety disks to prevent any possible leakage of the gas. This led to the build up of temperature and pressure in the storage tanks.
5. When the gas started leaking out, the operators tried to use the vent gas-scrubber that was designed to reduce the exhausting gas. But that scrubber was also shut down.
6. There was a flare tower that was designed to burn-off the gas escaping from the scrubber. That was not also in working condition.
7. The workers finally tried to spray water up to 100 feet to quench the gas (which is water soluble). But the gas was escaping from the chimney of 120-feet high.
8. The workers were not trained on safety drills or emergency drills or any evacuation plans. The gas escaped into the air and spread over 40 sq. km. About 600 people died and left 7000 injured and the health of about 2 million people was affected adversely. Even after 22 years, influence of the Central Government and the courts, the compensation had not reached all the affected people.

## ETHICAL RELATIVISM, Ethical Absolutism, Ethical Plurasism

There is a saying, “When in Rome do as Romans do”. Can this be applied in the case of MNCs? This is called *ethical relativism*. The actions of corporation and individuals that are accepted by law, custom and other values of a society can be morally right in that society. It is morally false, if it is illogical. It means, the corporation (and the engineers) functioning in other countries must understand their law, customs, and beliefs and act in line with those prevailing in that country. This will lead to disaster if the country is a developing one where the safety standards are given a go-bye. Laws and

On the other hand, the organizations may practice laws of the home country, without adjustments to the host culture. This stand is called *ethical absolutism*. This is again false, since the moral principles in a different culture come into conflicts, and implementation in the ‘hostile’ culture is almost impossible.

Hence, MNCs may adopt *ethical relationalism (contextualism)* as a compromise. Moral judgments are made in relation to the factors prevailing locally, without framing rigid rules. The judgments should be contextual and in line with the customs of other cultures. The *ethical pluralism* which views more than one justifiable moral solution is also adaptable. This principle accepts cultural diversity and respects the legitimate cultural differences among individuals and groups, of the host country.

## 5.2 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.

# Environmental Ethics

## KEY CONCEPTS

- Environmental ethics:** (1) the study of moral issues concerning the environment, and (2) a moral perspective, belief, or attitude concerning those issues.
- Invisible hand:** the ways in which pursuing self-interest in the competitive marketplace promotes the public good, for example, by providing quality products at lower cost, jobs, and wealth and philanthropy.
- Tragedy of the commons:** the ways in which the marketplace harms public goods (such as clean air and water) by creating unintended “externalities,” that is, harmful effects such as pollution that are not factored into the cost of products.
- Internalizing costs:** the cost of products and services is made to include indirect costs such as the effects of pollution.
- Sustainable development:** economic and technological patterns that are compatible with preserving environmental capacities to sustain future generations.
- Human-centered ethics:** the view that only humans have inherent worth and that other creatures and ecosystems have at most “instrumental value” as means to promoting human interests.
- Sentient-centered ethics:** the view that all conscious animals have inherent worth.
- Biocentric ethics:** the view that all living organisms have inherent worth.
- Ecocentric ethics:** the view that ecosystems have inherent worth.

# Environmental Ethics

Human life is possible because of the greenhouse effect, in which atmospheric gases such as water vapor and carbon dioxide block solar energy from escaping, after being reflected from the earth's surface. In 1988, however, NASA scientist James Hansen warned that the greenhouse effect is accelerating owing to human burning of fossil fuels that increase levels of greenhouse gases such as carbon dioxide (CO<sub>2</sub>). The change is small, but even a few degrees of global warming could melt enough of the polar ice caps to raise the oceans enough to cause severe flood damage. Other effects include major disruptions in weather patterns, such as increased drought, major shifts in rain patterns, and increased severity of hurricanes caused by rising ocean temperatures.

# Environmental Ethics

## **The Invisible Hand and the Commons**

Two powerful metaphors have dominated thinking about the environment: the invisible hand and the tragedy of the commons. Both metaphors are used to highlight unintentional impacts of the marketplace on the environment, but one is optimistic and the other is cautionary about those impacts. Each contains a large part of the truth, and they need to be reconciled and balanced.

The first metaphor was set forth by Adam Smith in 1776 in *The Wealth of Nations*, the founding text of modern economics. Smith conceived of an invisible (and divine) hand governing the marketplace in a seemingly paradoxical manner. According to Smith, businesspersons think only of their own self-interest: “It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest.”<sup>1</sup> Yet, although “he intends only his own gain,” he is “led by an invisible hand to promote an end which was no part of his intention. . . . By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it. I have never known much good done by those who affected to trade for the public good.”<sup>2</sup>

## Invisible Hands

the invisible hand contains a large element of truth. By pursuing self-interest, the businessperson, as entrepreneur, creates new companies that provide goods and services for consumers. Moreover, competition pressures corporations to continually improve the quality of their products and to lower prices, again benefiting consumers. In addition, new jobs are created for employees and suppliers, and the wealth generated benefits the wider community through consumerism, taxes, and philanthropy.

## Tragedy of Commons

The same kind of competitive, unmalicious but unthinking, exploitation arises with all natural resources held in common: air, land, forests, lakes, oceans, endangered species, and indeed the entire biosphere. Hence, the tragedy of the commons remains a powerful image in thinking about environmental challenges in today's era of increasing population and decreasing natural resources. Its very simplicity, however, belies the complexity of many issues concerning ecosystems and the biosphere. Ecosystems are systems of living organisms interacting with their environment—for example, within deserts, oceans, rivers, and forests. The biosphere is the entirety of the land, water, and atmosphere in which organisms live. Ecosystems and the biosphere are themselves interconnected and do not respect national boundaries. There is need for multifaceted and often concerted environmental responses by engineers, corporations, government, market mechanisms, local communities, and social activists.

# Role of Engineers towards Environmental Ethics

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

# Enviromental 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.

## ***2. 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.

Even the radioactive waste will lose 89% of its toxicity after 200 years, by which time it will be no more toxic than some natural minerals in the ground. It will lose 99% of its remaining toxicity over the next 30,000 years. The toxic chemical agents such as mercury, arsenic, and cadmium retain toxicity undiminished for ever.

# Enviromental Disasters

## 3. *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

## 4. *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 NO<sub>2</sub> 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.

# Environmental Disasters

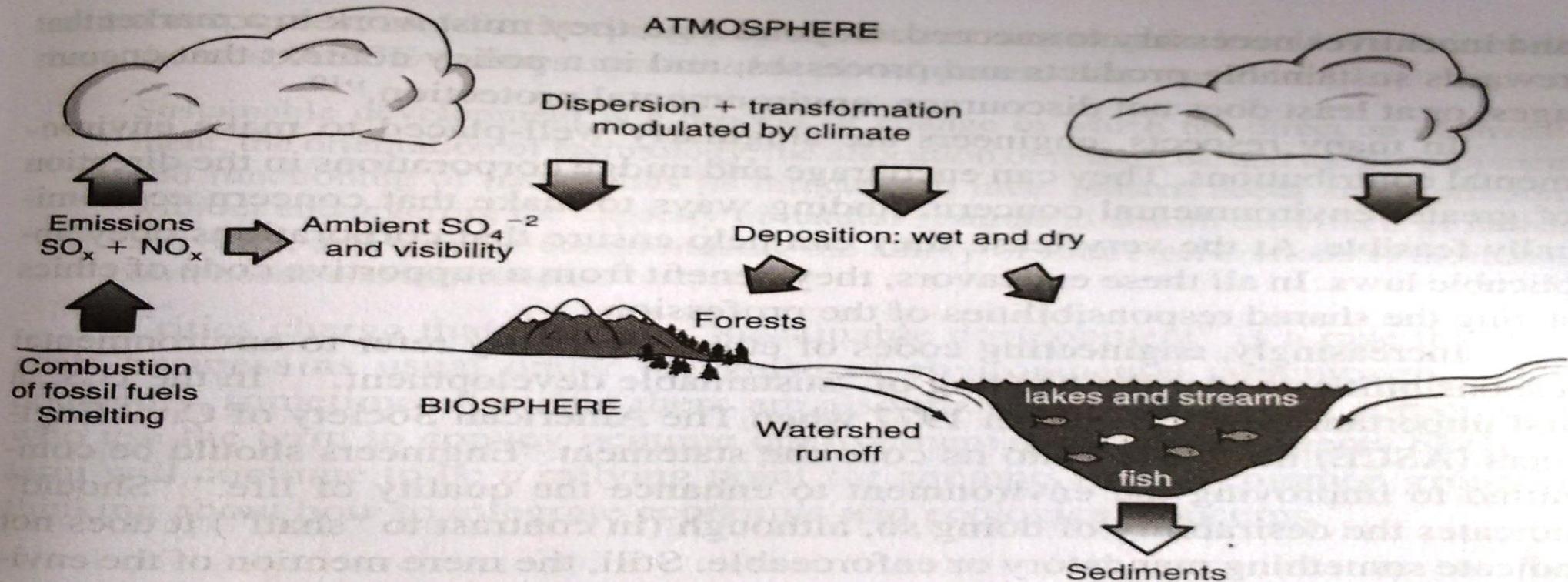
## **5. Global Warming**

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 °C 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, 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.

## **6. Acid Rain**

Large emissions of sulphur oxides and nitrous oxides are being released into 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.

# ACID RAIN



**FIGURE 8-1**

Acid deposition: sources and affected ecosystems. (National Research Council, Acid Deposition, Long-Term Effects [Washington, DC: National Academy of Sciences, 1986] p. 11. Diagram used with permission of National Academy Press. Also see Donald D. Adams and Walter P. Page, eds.,

# TERMINOLOGIES

## KEY CONCEPTS

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# Computer Ethics

## 5.3 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.

### 5.3.1 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 readjusting 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.

# Computer Ethics

## 2. Computer as the Object of Unethical Act

The data are accessed and deleted or changed.

- (a) *Hacking*: The software is stolen or information is accessed from other computers. This may cause financial loss to the business or violation of privacy rights of the individuals or business. In case of defense information being hacked, this may endanger the security of the nation.
- (b) *Spreading virus*: Through mail or otherwise, other computers are accessed and the files are erased or contents changed altogether. 'Trojan horses' are implanted to distort the messages and files beyond recovery. This again causes financial loss or mental torture to the individuals. Some hackers feel that they have justified their right of free information or they do it for fun. However, these acts are certainly unethical.
- (c) *Health hazard*: The computers pose threat during their use as well as during disposal. These

## 3. Problems Related to the Autonomous Nature of Computer

- (a) *Security risk*: Recently the Tokyo Stock Exchange faced a major embarrassment. A seemingly casual mistake by a junior trader of a large security house led to huge losses including that of reputation. The order through the exchange's trading system was to sell one share for 600,000 Yen. Instead the trader keyed in a sale order for 600,000 shares at the rate of one Yen each.

## 5.3.3 Property Issues

The property issues concerned with the computers are:

1. Computers have been used to extort money through anonymous telephone calls.
2. Computers are used to cheat and steal by current as well as previous employees.
3. Cheating of and stealing from the customers and clients.
4. Violation of contracts on computer sales and services.
5. Conspiracy as a group, especially with the internet, to defraud the gullible, stealing the identity and to forge documents.
6. Violation of property rights: Is the software a property? The software could be either a Program (an algorithm, indicating the steps in solving a problem) or a Source code (the

# Computer Crime

## 5.3.4 Computer Crime

The ethical features involved in computer crime are:

### 1. *Physical Security*

The computers are to be protected against theft, fire, and physical damage. This can be achieved by proper insurance on the assets.

### 2. *Logical security*

The aspects related are (a) the privacy of the individuals or organizations, (b) confidentiality, (c) integrity, to ensure that the modification of data or program are done only by the authorized persons, (d) uninterrupted service. This is achieved by installing appropriate uninterrupted power supply or back-up provisions, and (e) protection against hacking that causes dislocation or distortion. Licensed anti-virus packages and firewalls are used by all computer users to ensure this protection. Passwords and data encryption have been incorporated in the computer software as security measures. But these have also been attacked and by-passed. But this problem is not been solved completely.

## 5.4 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 involve 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.

## 5.5 ENGINEERS AS MANAGERS

### 5.5.1 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.

### 5.5.2 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:

## Managers – Resolving Conflicts

### **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.

### 5.6 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.

## Deceptives Ads

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.

# Consulting Engineers

## **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 and technological means.

# Consulting Engineers

## **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.

The NSPE codes on the advertisement by consultants provide some specific regulations. The following are the activities prohibited in advertisement by consultant:

1. The use of statement containing misrepresentation or omission of a necessary fact.
2. Statement intended or likely to create an unjustified expectation.
3. Statement containing prediction of future (probable) success.
4. Statement intended or likely to attract clients, by the use of slogans or sensational language format.

# Engineers as Expert Witness

## 5.7 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. The focus is on the past.

The functions of eye-witness and expert-witness are different as presented in the Table 5.1.

**Table 5.1** Eye-witness and expert-witness

<i>Eye-witness</i>	<i>Expert-witness</i>
<ol style="list-style-type: none"><li>1. Eye-witness gives evidence on only what has been seen or heard actually (perceived facts)</li></ol>	<ol style="list-style-type: none"><li>1. Gives expert view on the facts in their area of their expertise</li><li>2. Interprets the facts, in term of the cause and effect relationship</li><li>3. Comments on the view of the opposite side</li><li>4. Reports on the professional standards, especially on the precautions when the product is made or the service is provided</li></ol>

# Engineers as Expert Witness – **ABUSING POSITION**

The engineers, who act as expert-witnesses, are likely to abuse their positions in the following manners:

## **1. Hired Guns**

Mostly lawyers hire engineers to serve the interest of their clients. Lawyers are permitted and required to project the case in a way favorable to their clients. But the engineers have obligations to thoroughly examine the events and demonstrate their professional integrity to testify only the truth in the court. They do not serve the clients of the lawyers directly. The hired guns forward white lies and distortions, as demanded by the lawyers. They even withhold the information or shade the fact, to favor their clients.

## **2. Money Bias**

Consultants may be influenced or prejudiced for monetary considerations, gain reputation and make a fortune.

## **3. Ego Bias**

The assumption that the own side is innocent and the other side is guilty, is responsible for this behavior. An inordinate desire to serve one's client and get name and fame is another reason for this bias.

## **4. Sympathy Bias**

Sympathy for the victim on the opposite side may upset the testimony. The integrity of the consultants will keep these biases away from the justice. The court also must obtain the balanced view of both sides, by examining the expert witnesses of lawyers on both sides, to remove a probable bias.