- ✓ 'Virtue ethics' draws attention to humility, appreciation of beauty, love, and affection and gratitude towards the world of nature.
- ✓ 'Right ethics' stresses that the fundamental right to life enforces a right for livable environment in a particular period of time, when pollution and depletion of resources has reached a dangerous proportion.
- ✓ 'Duty ethics' urges that the respect for human life implies more concern for nature than has been traditionally recognized.
- ✓ 'Utilitarianism' stresses that human pleasures and self-interests are linked to nature in so many ways apart from the stage the engineering products are produced from natural resources.

COMPUTER ETHICS

7.13 INTRODUCTION

The computer is considered one of the most important technological advances of the twentieth century. As the general public becomes increasingly 'computer literate,' the gap between technology and peoples' intellect notably shrinks. The readily available computers, software, and assorted output devices have enlightened many. It is becoming increasingly important, as computers become the technological backbone of modern society. But, in turn, they have increased the using of computers for unethical activities, privacy invasion and illegal purposes leading to serious ethical issues. Some of the issues arise due to the computer abuse are: hacking[c], cyber crimes[c], computer virus[d], software piracy, cyber squatting[d], and Internet defamation.

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[c] Hacking is a crime in which a person cracks a system and gains unauthorized access to the data stored in them.

[c] Cyber crimes refer to the various kinds of computer and Internet related crimes.

[d] Viruses are programs introduced deliberately for destroying or altering the operating systems and database of computer.

[d] Cyber squatting is an offence that relates to the registration of a domain name by an entity that does not have an inherent right to identical trademark registration.

"The act of breaking into a computer system has to have the same social stigma as breaking into a neighbor's house. It should not matter that the neighbor's door is unlocked. Misguided use of a computer is no more amazing than drunk driving an automobile." – Ken Thompson

Legal sanctions against abusive use of computers are a reactive approach. A proactive approach is to teach engineering students about computer ethics in classrooms. It is anticipated that through this study of computer ethics, students will personalize the need for developing ethical standards of behavior as computer users. Therefore they will develop their code of ethical behavior. Also as designers, programmers, managers, and system analysts, the engineers should have the moral responsibility to help promote the ethical use of computers. It is therefore important for computer professionals, engineers, policy makers, leaders, teachers, and social thinkers to get involved in the social and ethical impacts of this communication technology.

7.13.1. What Is Computer Ethics?

- ✓ *Computer ethics is the study of ethical issues that are associated primarily with computing machines and the computing profession.*
- ✓ It is the field of applied professional ethics dealing with ethical problems aggravated, transformed, or created by computer technology.
- ✓ Cyber ethics is the field of applied ethics that examines moral, legal, and social issues in the development and use of cybertechnology.
- ✓ Cybertechnology refers to a broad range of technologies from stand-alone computers to the cluster of networked computing, information and communication technologies.
- ✓ Thus computer ethics is the analysis of the nature and social impact of computer technology and the corresponding formulation and justification policies for the ethical use of such technology.

7.14. CATEGORIES OF COMPUTER ETHICS PROBLEMS

The three board categories of computer ethical problems are:

1. Those ethical problems for which the computer is the instrument of the unethical act. For example, the use of a computer to defraud the bank.
2. Those problems for which the computer is the object of the unethical act. For example, stealing computer software and installing it on one's own computer to access others' information.
3. Those problems associated with the autonomous nature of computers.

7.14.1. Computers As The Instrument Of Unethical Behavior

Computers are sometimes used as an instrument for carrying out some unethical activities. The two important unethical acts under this category are:

1. Bank robbery; and
2. Privacy

1. **Bank Robbery**
   - ✓ Computers can be used to steal from an employer; outsiders can get into a system and steal from an institution such as a bank. In the same way, a company can use the computer to steal from its clients and customers.
   - ✓ Computers are used more efficiently to steal money in a bank. The robber simply sits at a computer terminal, invades the bank's computer system and directs some of the banks assets be placed in a location accessible to him. The use of computer makes the crime impersonal. The criminal never comes face to face with the victims.

2. **Privacy**
   - ✓ *Privacy means the basic right of an individual to control access to and use of information about himself.*
   - ✓ Computers make privacy more difficult to protect, since large amounts of data on individuals and corporations are centrally stored on computers where an increasing number of individuals can access it.
   - ✓ Invasions of privacy can be harmful to an individual in two ways, as given below:
     1. The leaking of private information can lead an individual being harassed or blackmailed.
     2. Personal information can also be considered personal properly. Any unauthorized use of this information is theft.

7.14.2. Computers As The Object Of Unethical Acts

- ✓ When the computers are used as the objects of the unethical acts, ethical issues may arise. This act is prevalently known as '*hacking*'.
- ✓ ***What does hacking mean?***
  Hacking is nothing but gaining unauthorized access to a database, implanting false information in a database or altering existing information, and disseminating viruses over the Internet.
- ✓ In other words, hacking is a crime in which a person cracks a system and gains unauthorized access to the data stored in them.
- ✓ Accessing private information violates the private rights of individuals and corporations.
- ✓ *Hacking* has thrown a challenging threat to the internal security of a nation when hackers develop illegal access to the secret military information.
- ✓ ***Computer viruses:*** *Viruses are programs introduced deliberately for destroying or altering the operating systems and database of computer.*
- ✓ Transmission of computer viruses leads to the complete destruction of files and data stored in the computers. This type of destruction frequently occurs in the records of financial institutions, corporations, government offices, and taxpayers.

The process of committing computer crimes such as stealing or cheating clients or consumers secrecy in the fraudulent uses of computer networks is called embezzlement.

Autonomous Computers

Autonomous nature of computers creates other ethical problems.

Computer autonomy refers to the ability of computer to make decisions without the intervention of humans. This autonomous function of computers creates a lot of negative implication.

Example illustrating negative implication of computer autonomy: An autonomous computer, responsible for running a spaceship, wrongly directed the spaceship against the human designed it, instead of heading towards Jupiter.

Example illustrating positive implication of computer autonomy: Autonomous computers are valuable for automatic monitoring of certain manufacturing processes.

However, the autonomous computer application creates unethical activities in most cases. For example, autonomous computers are used in trading of some major stock market exchanges. Some brokers and institutional investors utilize computers to sell stocks automatically for their favor.

Autonomous computer systems also create problems when they have been used in military weapons. Many of the weapons used by military sources depend greatly on computer sensors and computer controls. Sometimes the instability of computer sensors and controls may create an unstable situation, which may lead to the serious conflicts.

Thus although autonomous computers are productive and more efficient in more areas, eventually there should be some human control over them in order to prevent disasters.

COMPUTER CODE OF ETHICS

Many organizations have developed codes of ethics for computer use. In order to overcome the various ethical issues of computer ethics, the Computer Society of India has developed the 'Ten Commandments' of computer ethics.

'Ten Commandments' of computer ethics are:

1. *Don't use a computer to harm other people.*
2. *Don't interfere with other people's computer work.*
3. *Don't snoop around in other people's computer files.*
4. *Don't use a computer to steal.*
5. *Don't use a computer to bear false witness.*
6. *Don't copy or use proprietary software for which you have not paid.*
7. *Don't use other people's computer resources without authorization or proper compensation.*
8. *Don't appropriate other people's intellectual output.*

"Avoid injuring others, their property, reputation, or employment by false or malicious action." – *IEEE Code of Ethics*

9. *Think about the social consequences of the program you are writing or the system you are designing.*
10. *Use a computer in ways that insure consideration and respect for your fellow humans.*

WEAPONS DEVELOPMENT

TRODUCTION

Military or Defense industry uses most of world's latest technological activity. The orld spends much of its money in the new development of military weapons. rs involve either directly or indirectly in designing and developing of these new s.

re are several reasons for an engineer to join the military services. The first and t reason is that of patriotism and prudential interest. The latter can be threats or den from the government or the ruler of the country.

re are also several reasons for an engineer to refuse the war work. Because ntially the purpose of designing war weapons is to kill human beings. Therefore sponsible engineers feel that the activity of weapons development as unethical. y engineer has to decide by examining his or her own conscience whether to work work in defense-related industries.

ENGINEERS IN DEFENSE INDUSTRY

of the areas, which provide number of jobs opportunities ting and developing new weapons.