GUDLAVALLERU ENGINEERING COLLEGE

(An Autonomous Institute with Permanent Affiliation to JNTUK,Kakinada)

Seshadri Rao Knowledge Village, Gudlavalleru – 521 356.

Department of Computer Science Engineering

HANDOUT

on

ENGINEERING AND SOCIETY

Vision

To be a Centre of Excellence in Computer Science and Engineering education and training to meet the challenging needs of the industry and society. Computer Science and Engineering.

Mission

- To impart quality education through well-designed curriculum in tune with the growing software needs of the industry.
- To serve our students by inculcating in them problem solving, leadership, teamwork skills and the value of commitment to quality, ethical behavior &respect for others.
- To foster industry-academia relationship for mutual benefit and growth.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- Identify, analyze, formulate and solve Computer Science and Engineering

  problems both independently and in a team environment by using the appropriate modern tools.
- Manage software projects with significant technical, legal, ethical, social, environmental and economic considerations.
- Demonstrate commitment and progress in lifelong learning, professional development, leadership and communicate effectively with professional clients and the public.

HANDOUT ON ELEMENTS OF ENGINEERING AND SOCIETY

Class& Sem. :I B.Tech – II Semester Year :2019-20
Branch : CSE Credits : 3

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1. Brief History and Scope of the Subject

Professional values, ethics, and attitudes, are defined as the behavior and characteristics that identify professional accountants as members of a profession. These include the ethical principles generally associated with, and considered essential in defining, the distinctive characteristics of professional behavior. Ethics are involved in all of our interpersonal decision and they impact every aspect of our professional and personal lives. In this course you will examine the Ethical Decision-Making Model and the Code of Ethics and Guidelines for Career Development Practitioners.

2. Pre-Requisites

- Basic knowledge on Professional Ethics and Engineer's Responsibilities.
- Able to generalize the surroundings.

3. Course Objectives:

Students should be able

- To understand the Ethics and Human values.
- To equip the students to have a basic awareness on environmental and socio economic factors.
- To familiarize with the rights and responsibilities of an Engineer.
- To elucidate the rules and regulations of patents and trade laws

4. Learning Outcomes:

Upon successful completion of the course, the students will be able to

CO1: Comprehend different Moral Perspectives and one's own Ethical Standards.
CO2: Understand the concept of safety and risk.
CO3: Explain different initiative to protect nature.

CO4: Identify role of information Technology.

CO5: Understand different forms of infringement of intellectual Property rights

CO6: Analyze the importance of Entrepreneurship.

5. Program Outcomes:

Engineering Graduates will be able to:

a.**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

b. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

c. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

d. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

e. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

f. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

g. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

h. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

i. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

j. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

k. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

l. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

6. Mapping of Course Outcomes with Program Outcomes:

	a	b	c	d	e	f	g	h	i	j	k	l
CO1							M	H				
CO2								M	H			
CO3												H
CO4					H					M		
CO5										H		
CO6								H				

7. Prescribed Text Books:

- Professional ethics and human values by Dharanikota Suyodana, Maruti Publications.

- Environmental Studies by Deeksha Dave, P Uday Bhaskar, Cenage Learning.
- "Intellectual Property",by Deborah E.Bouchoux, Cenage learning, New Delhi.
- Entrepreneurship by Narayana Reddy, Cenagge Learning.

8. Reference Text Books:

- **"**Professional Ethics and Human values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications.
- R.Radha Krishnan, S.Balasubramanian:"Intellectual Property Rights", Excel-Books, New Delhi.
- Prabhuddha Ganguli:"Intellectual Property Rights", Tata MC-Graw-Hill New Delhi.

9. URLs and Other E-Learning Resources

Some important topics in Professional Ethics, Patents and Trademarks can be seen in the website and down loaded i.e

- http://ethics.iit.edu/teaching/professional-ethics.
- http://www.wipo.int/export/sites/www/about-ip/en/iprm/pdf/ch1.pdf.

10. Lecture Schedule / Lesson Plan

UNIT	TOPIC	PERIODS
I	**Human Values**	
	What is Engineering and who is an Engineer. Introduction to Human values Morals, Values Ethics	1
	Service Learning and Civic Virtue	1
	Value time, Co-Operation and Commitment	1
	Empathy, Self-Confidence and Character	1
	Work Ethics, and integrity	1

II	**Engineer's Responsibilities and Rights**	
	Safety and Risk and its types	1
	Collegiality-Techniques for achieving collegiality	1
	Group/Team-Two senses of Loyalty, Rights	1
	Professional Responsibilities	1
	Confidential and Proprietary information	1
III	**Global Climatic Issues and Mitigation Strategies**	
	Greenhouse effect Global Warming	1
	Acid rain Ozone Layer Depletion	1
	Monetary Protocol, Rio declaration Kyoto Protocol and Johannesburg Summit	1
IV	**Future challenges to society**	
	Sustainable development and Measures	1
	Water conservation practices	1
	Rain water harvesting Watershed management	1
	Resettlements and rehabilitation of people	1
	Waste land reclamation Role of an engineer in mitigation societal problems	1
V	**Patent Law, Trade Marks and CopyRights**	
	Introduction – Rights and Limitations	1
	Patent requirements and process	1

	Owner ships, Transfer and infringement	1
	Trade Mark and Registration and Transfer	1
	Copy Right and Registration and Transfer	1
VI	**Entrepreneurship**	
	Concept of entrepreneurship	1
	Characteristics and skills of entrepreneur	1
	Role of entrepreneur in economic development	1
	TOTAL NO. OF CLASSES	**28**

11.Seminar Topics

- Types of Risk
- Patent Infringement

UNIT I

HUMAN VALUES

Objective:

- To understand the concepts of morals, values and ethics.

Syllabus:

What is engineering – who is an engineer - Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue -Value time – Co-operation – Commitment – Empathy–Self-confidence –Character.

Learning Outcomes:

The student should be able to

1. Understand the concepts of morals & values.
2. How values, ethics and integrity can be shown in the normal course of work.
3. Understand the concepts of Service learning and Civic virtue.

Learning Material

WHAT IS ENGINEERING:

The term *Engineering* is derived from the Latin word ingenium, meaning "cleverness" and *ingeniare*, meaning "to contrive, devise".

Definition: Engineering is the application of mathematics and scientific, economic, social, and practical knowledge in order to invent, innovate, design, build, maintain, research, and improve structures, machines, tools, systems, components, materials, processes, solutions, and organizations.

(OR)

The branch of science and technology concerned with the design, building, and use of engines, machines and structures.

❖ **The field of engineering is divided into a large number of areas**:

1. **Mechanical Engineering**: involves design, manufacturing, inspection and maintenance of machinery, equipment and components as well as control systems and instruments for monitoring their status and performance.
2. **Electrical Engineering**: involves design, testing, manufacturing, construction, control, monitoring, and inspection of electrical and electronic devices, machinery and systems.
3. **Civil Engineering**: involves design, construction, maintenance and inspection of large infrastructure projects such as highways, railroads, bridges, tunnels, dams and airports.
4. **Aerospace Engineering**: involves design, manufacturing and testing of aircraft and spacecraft as well as parts and components such as airframes, power plants, control and guidance systems, electrical and electronic systems, and communication and navigation systems.
5. **Nuclear Engineering:** involves design, manufacturing, construction, operation, and testing of equipment, systems and processes involving the production, control and detection of nuclear radiation.
6. **Structural Engineering**: involves design, construction and inspection of load-bearing structures such large commercial buildings , bridges and industrial infrastructure.
7. **Biomedical Engineering**: is the practice of designing systems, equipment and devices for use in the practice of medicine.
8. **Chemical Engineering**: is the practice of designing equipment, systems and processes for refining raw materials and for mixing, compounding and processing chemicals to make valuable products.

9. **Computer Engineering**: is the practice of designing computer hardware components, computer systems, networks and computer software.
10. **Industrial Engineering**: is the practice of designing and optimizing facilities, equipment, systems and processes for manufacturing, material processing, and any number of other work environments.
11. **Environmental Engineering**: is the practice of preventing, reducing and eliminating sources of pollution that affect air, water and land.

WHO IS AN ENGINEER:

- **"Scientists investigate that which already is; Engineers create that which has never been"------- Albert Einstein**
- An *engineer* is a person who uses scientific knowledge to design, construct, and maintain engines and machines or structures such as roads, railways, and bridges.
- An engineer is one who effectively adapts the findings of science to the use of man.
- A person specifically trained and experienced in planning and developing the structures and devices, and in supervising the processes for the benefit of mankind.
- Engineers are involved in the implementation, application, design, development and management of projects and processes.
- Engineers are problem solvers, organizers, communicators, calculators, scientists, inventors, designers, builders and great thinkers.

Engineers Eg:

1. Mokshagundam Visweswaraya ------ Father of Indian Engineering
2. A.P.J.Abdul Kalam----- Father of Indian Rocketing
3. Narayana Murthy ------ Founder of Infosys
4. M.N. Dastur ------ Designer of Steel Plants

5. Brahm Prakash ---- Atomic energy Metallurgist

MORALS:

- Stories of great people like Mahatma Gandhi, Rabindranath Tagore, Vivekananda, Sarojini Naidu, Nelson Mandela and stories from great epics teach us several good qualities like truthfulness, honesty, loyalty, gratitude, integrity, courage, discipline, spirituality and their importance.
- Mahabharatam, Ramayanam inspire people and teach them "morals" and "values".
- Engineers as professionals should follow morals, values and ethics taught by great people when they work for the welfare of the society.
- Morals mean principles of right and wrong. Morals also mean manners or conduct of men as social being in relation to each other.
- Morality relates to human conduct. Moral principles are, for example, against stealing other's property, against telling lies.
- Morals are more like principles, based on teachings and often guided by societal and religious standards.
- Morals refer to the way in which people behave in relationships and in wider society.
- Values like honesty, empathy, truthfulness, humbleness, loyalty, efficiency, love for others, will develop a man as a morally good person.

VALUES:

- The word value is derived from Latin word "*valere*" which means "*to be of worth*" or "*to be Strong*".
- Values are the rules by which we make decisions about right and wrong, should or shouldn't, and good or bad.
- Values help the individuals in their mode of conduct, approach, attitude when they deal with people of different caliber in the society.
- Values refer to the standards that guide our actions, judgements and attitudes.

- Values can be imparted to the students through personality development programmes.

Values can be classified into:

1. Personal values--- related to self
2. Social values ---- related to society
3. Cultural values ---related to culture
4. Institutional values – related to an organization.
5. Nationalistic values—like secularism, democracy and freedom.
6. Human values ---- like kindness, truth and honesty.
7. Scientific values --- like discoveries, inventions
8. Moral values --- like virtues, tolerance.
9. Core human values--- those values which never change fundamentally, inspite of all the change around you ,are your core values. For example: Integrity, Love, Peace, Truth, Right conduct, Non-Violence.

ETHICS:

- Ethics comes from the Greek word *ethos*, which means "*character or customs*".
- Ethics is also known as *moral philosophy*. It is a branch of philosophy that involves systematizing, defending, and recommending concepts of right and wrong conduct.

Classification of Ethics:

1. **Normative Ethics:** This deals with the practical means of determining a moral course of action.
2. **Applied ethics:** This explains how moral outcomes can be achieved in specific situations.
3. **Descriptive Ethics :** This is the study of people's beliefs about morality.
4. **Meta ethics:** This gives the theoretical meaning and reference of moral propositions and how their truth values, if any, may be determined.

5. **Professional Ethics:** Related to various professionals like Doctors, Lawyers.
6. **Engineering ethics:** Related to Engineers, engineering practice and industries.
7. **Business Ethics:** Related to people involved in Business.
8. **Work Ethics:** Related to employers and employees at work place.

What affects Ethics?

1. Greed
2. Fear
3. Pressure

- Mahatma Gandhi, the father of our nation insists the importance of values and ethics when he talks about seven social issues, which are as follows:
  1. Wealth without work.
  2. Pleasure without conscience.
  3. Knowledge without character.
  4. Commerce without morality.
  5. Science without humanity.
  6. Religion without sacrifice.
  7. Politics without principles.
  - According to Gandhiji, the above said seven social issues can help society, only if ethics is followed.

INTEGRITY:

- Integrity means" soundness of moral character". An organisation success depends on the integrity of its employees.
- The person of integrity has convictions and commitments. It leads to consistency of character and operation in different situations and contexts.
- Integrity is the quality of being honest, fair and good. It is a state of being whole or unified.
- Integrity is measured by a person's conduct.

- Practicing integrity requires courage. This courage is obtained when wisdom and integrity join hands.
- **There are three tools for developing integrity:**
  1. **Encouraging and Discouraging Integrity:** A person lacking self esteem, friendships and financial stability has a higher than normal likelihood of acting without integrity.
  2. **Question of Integrity:** Our integrity is always on test.
     - Is this the right course of action?
     - Am I acting at the right time?
     - Am I acting with the right intension?
     - Am I acting with the right person?
  3. **Signs of Integrity:** Integrity can be visibly perceived in the behavior of an individual. For an engineer, professional integrity is the key under difficult situations. An engineer with professional integrity will be ready for any kind of challenge and additional responsibility.

     Other forms of lack of integrity in Research &Development:

     1. Trimming Data
     2. Cooking Data
     3. Forging Data
     4. Plagiarism
     5. Multiple Authorship

WORK ETHICS:

- Work ethic is a characteristic attitude of a group of people or workers towards morality of work. Work ethics include good habits , good attitudes, good manners, good appearance, and good behavior.
- Work ethic also includes honesty, reliability, being on time and dependability.
- The moral responsibility of the worker is to ensure that no one's rights, privacy or freedom are affected.

- Employees should avoid arguments with employers. They should not blame co-workers.
- Employees with good work ethic are preferred for promotions to higher positions with more responsibility. If one fails to show up minimum level of work ethic, he/she may lose her job also.

Parameters for good work ethics:

- **Attendance**: Arrives on time and gives advance notice of absence.
- **Character**: Displays loyalty, honesty, trustworthiness, dependability, reliability, initiative, self-discipline, and self-responsibility.
- **Teamwork**: Respects the rights of others; is a team worker and is cooperative.
- **Appearance**: Displays appropriate dress, grooming, hygiene and etiquette.
- **Attitude**: Demonstrates a positive attitude.
- **Productivity**: Good work habits result in a good work product.
- **Organizational Skills**: Manifests skill in personal management, time management, prioritizing, flexibility, stress management and the ability to deal with change.
- **Communication**: Displays appropriate verbal and nonverbal skills.
- **Cooperation**: Displays leadership skills; maintains appropriate relationships with supervisors and peers.
- **Respect**: Deals appropriately with diversity and treats everyone with respect.
- **Reliability**: When an employee is punctual, follows through his tasks, shows up ready to work, he is said to be reliable.
- **Positive character**: During the time when the business goes tough, employees with positive character will be of great help to the employer.
- **Goal-oriented**: Employees should develop goal-oriented behavior.
- **Confidentiality**: Self-confidence is important for employee to perform their tasks in a effective and efficient way.

- **Honesty**: Employees should show honesty in performing their responsibilities.

SERVICE LEARNING:

- Service is an act of help or assistance when somebody is in distress. Learning means the act of gaining knowledge by study, instruction or scholarship.
- Service learning is the process of involving students in community activities.
- Under faculty support, students are given an opportunity to practice the knowledge, attitudes, and skills learned in their didactic course work in a 'real world' environment.
- Service learning is a method under which students learn and develop through active participation in thoughtfully organized service camps conducted as per the needs of the community.
- It builds partnerships between young people and the community. Partnerships may be related to businesses, community based organizations, social service agencies and other groups that share the project's goals.

Some of the strategies to strengthen service learning are as given below:

1. Academic collaborations
2. Student voice
3. Classroom discussion
4. Impact analysis
5. Community partnerships
6. Assessment and feed back

CIVIC VIRTUE:

- Civic comes from a Latin word "civitas" which means "civilized" or "living in city".
- Virtue comes from the Latin word "virtus" which means being "moral" or "good".

- Virtue means good quality. Civic relates to society and the environment. Hence 'civic virtue' mean the good habits and qualities that one has to follow when he/she moves in the society and deals with environment.
- Certain civic virtues are caring, sharing, respect for others, living peacefully and letting others live peacefully.
- Yawning, sneezing, relaxing the body by bending backwards, snoring and spitting, such habits are to be avoided infront of others in a gathering.
- A person who is conscious of the above habits is said to have 'civic sense' or 'civic manners'. In total, these habits are called 'civic virtues'.
- Civic virtue is a morality or standard of righteous behavior of a citizen**.**
- The manifestation of civic virtues is seen in the citizen behavior in terms of voting, volunteering, organizing blood donation camp or attending a public meeting etc.,

The duties are:

1. To pay taxes to the local government and state in time.
2. To keep the surroundings clean and green.
3. Not to pollute the environment.
4. To follow the road safety rules.

The rights are:

1. To vote the local or state government.
2. To contest in the elections to the local or state government.
3. To seek a public welfare facility such as a school, hospital or a community hall or transport or communication facility, for the residents.
4. To establish a green and safe environment follow ethical principles.
5. People have inalienable right to accept or reject a project in their area.

According to *George Washington* civic 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.
2. **Self- Restraint**: Citizens to live in a free society with limited government each citizen must be able to control or restrain himself.
3. **Self- Assertion**: It means citizens must be proud of their rights, and have the courage to stand up in public and defend their rights.
4. **Self- Reliance**: Self-reliant citizens are free citizens in the sense that they are not dependent on others for their basic needs.

These civic virtues, applicable to local, state and central governments, nourish freedom and civil liberty at the root of democracy.

VALUING TIME:

- The amount of time in a day is constant, that is, 24 hours. It is not possible to have more than 24 hours in a day. Since the available time is fixed, one has to utilize the time usefully by planning it wisely.
- Time is to be valued and valuing time is a virtue. Time lost cannot be regained.
- If one wants to come up in life and succeed, he/she has to be a good "time management" person.
- Please remember "time is gold". "Time and tide wait for none". Hence, one will have to keep a check on his/her day's work.
- One has to manage and complete that day's work that day itself. If time is not properly managed, one may miss opportunity.
- By being late, one may even miss a flight to attend an important appointment or a business deal.
- In most of the competitions, whether it is sports or academics , valuing time is viewed as more an art than science.

- The difference between the winner and the loser is the extra stretch. So consider the time available and see how best you can put forth efforts to complete the given task successfully.
- One best way of understanding the value of time is seeing your time table and understand how the activities are planned through out the semester.
- **Time management is made possible by planning in the following ways:**
    1. Urgent but an important work ---it is to be done immediately.
    2. Important but not an urgent work – it is to be done before it becomes urgent.
    3. An urgent but not an important work --- it is to be done as soon as possible.
    4. An unimportant but not an urgent work –it is to be done when one finds time.

In industries and organisations, time management, that is, "valuing time" is very much essential for better production and efficiency.

CO-OPERATION:

- The attitude of individuals to co-ordinate with a team of people, is known as "co-operation". Cooperation is the process of working or acting together.
- Co-operation develops team spirit and results in team work in an organization. For better production, team work is a must.
- Co-operation may be extended o others by giving a good idea, a good suggestion, a form of assistance or even physical work. Some times co-operation also means non-interference in the work of others.
- People in crises get all the support from people in the safer areas in terms of clothes, food, utensils, bed sheets etc.,.
- Some of the intelligent students in the class try to help those who lag behind.

- Sports and games are integrated to the class room time table so that the students are taught how to cooperate, while competing, with each other.
- Cooperation exist between the employers and employees, between the superiors and subordinates, among the colleagues, between the producers and the suppliers, and between the organization and its consumers.
- The absence of cooperation leads to lack of communication, misinformation, void in communication, and undue delay between supply, production, marketing and consumption.

The impediments to successful cooperation are:

1. Clash of ego of individuals.
2. Lack of leadership and motivation.
3. Conflicts of interests, based on region, religion, language and caste.
4. 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 is the state or quality of being dedicated to a cause, activity etc.,. It is also known as a pledge or an understanding.
- Commitment may mean the promise as observed in election manifestos, personal commitment, a legally binding exchange of promises such as contract, organizational commitment or a brand commitment.
- If I take a loan from bank for my house construction, I am undertaking a commitment to pay the house loan back in next 10 years with interest. It is an example for written commitment.
- Those who fail to honor their commitment lose their face value and no one enters into any type of understanding with such type of people.

- Honoring commitments is much more than amassing wealth. There are cases where people commit suicide just because they cannot honor their commitment and hence cannot face the society.

Organisational commitment:

- It refers to the employee's psychological attachment to the employer or organization where he is employed**.**

Job satisfaction:

- It is defined as an employee's feelings about their job, and the degree to which an employee experiences a 'sense of oneness' with their organization.
- There are many factors that impact job commitment : role stress and empathy.

Role stress:

- When role of an employee is not clearly defined and is subject to incompatible demands or requests to do or not to do he will be under lot of stress.
- Unkept commitments will result in dishonest behavior. An attitude of "sir, I will try but I cannot commit", indicates that one does not have any commitment. Unkept commitments also lead to
    - Depression
    - Loss of business
    - High stress level
    - Broken homes
    - Poor relationships
    - Unfulfilled life.
- Our strongest relationships are tied together by a string called "commitment". All relationships go sour without commitment.
- **Commitment implies:**
    1. Dependability
    2. Reliability
    3. Caring
    4. Empathy

5. A sense of duty
6. Sincerity
7. Character
8. Integrity
9. Loyalty

Commitment says:

- I am willing to sacrifice because I care
- I Am a person of integrity you can trust me.
- I will not let you down.
- Despite hardships, I will come.
- I will not let you down in good or bad times.
  - Commitment means surrendering our personal wants for another person's needs. Commitments act as a glue which bonds relationships.
  - Commitment means sacrificing fun and willingness to accept sorrow. A commitment means putting the other person's needs a head of one's own. For example,

  1. Commitment to a customer means providing good service.
  2. Commitment to patriotism means sacrifice of one's self to the nation.
  3. Commitment to job means integrity.
  4. Commitment to society means responsibility.
- Hence, make a commitment and stay committed.

EMPATHY:

- The word empathy comes from the Greek word "empathia".
- Empathy means putting oneself in the position or situation of someone else and thinking as the latter and taking suitable action. If you want to empathize someone, put yourself in his or her position and look at things as seen by him or by her and then come to conclusion based on values.

- If you are capable of recognizing the emotions experienced by another person, you are said to have empathy. Empathy leads to compassion.
- Empathy is the most preferred trait for some select jobs such as nurse, teacher or manager.

Empathy with customers, employers, employees and family members improves relationships. It generates understanding, loyalty, peace of mind and higher productivity.

- Empathy is positively related to intrinsic motivation and effective problem-solving. Thus empathy is an important aspect of effective leadership.

To practice "empathy", a leader must have or develop in him, the following characteristics.

1. Understanding others
2. Service orientation
3. Developing others
4. Leveraging diversity
5. Political awareness

The benefits of empathy include:

1. Good customer relations (in sales & service, in partnering).
2. Harmonious labour relations (in manufacturing).
3 .Good vendor-producer relationship (in partnering).

- A proverb says, "Do to others what you want others to do, to you. Don't do to others what you don't want others to do, to you". This is the basic concept of empathy.

SELF-CONFIDENCE:

- Self confidence is an attitude that allows individuals to think about themselves and their situations positively and in a realistic way**.**
- Self confident people believe that they can achieve what they wish, plan and expect, trust their own abilities and have an absolute control in their lives.

- Having self confidence does not mean that individuals will be able to do everything.
- Self confident people take more risk when compared to people who fear failure.
- A faculty member who is very confident of himself in delivering impressive lectures may find it uncomfortable to play cricket match in a ground.
- Practice makes man perfect, similarly practice makes on more self confident in a given activity or task.

There are many strategies to develop self confidence. They are

1. Focusing on strengths.
2. Taking risks in a calculated way.
3. Using self talk, rather than depending on others.
4. Evaluate yourself.
   - When you hear from others that you are good, your self esteem increases, and this keeps you psychologically and physically healthy. Low self esteem may even force people into antisocial behavior.

Self confidence is characterized by following:

1) Assertiveness 2) Trust 3) Optimism 4) Eagerness 5) affection 6) Pride

7) Independence 8) Ability to handle criticism

The people with self confidence have the following characteristics:

1. A self assured standing
2. Willing to listen to learn from others and adopt
3. Frank to speak the truth and
4. Respect other's efforts and give due credit.

The factors that shape self confidence in a person are:

1. Heredity
2. Friendship
3. Influence of superiors/role models

4. Training in the organization
5. Influence of society.

CHARACTER:

- Character is embodiment of one's personality in terms of his commitment, hard work or conduct.
- The term character refers to the presence of all good human values and forms the basis for one's personality and credibility.
- Achieve success in the job like a salesman and Engineer, a professional, a Lawyer, or a Doctor, it is desirable to master certain skills and techniques, like neat appearance, good communication skills, and greater character building.
- To achieve strength in character, bad habits should be eliminated and replaced by good habits.
- The character of a person is the sum total of his tendencies and the inclination of his mind.
- Character is the sum total of a people values, beliefs, and personality. It is reflected in one's behaviour , and also in one's actions.
- It is to be preserved more than the richest jewel in the world. Character is a combination of integrity, unselfishness, understanding, courage, loyalty and respect others; just like carbon determines the quality of steel, character determines the quality of a man.
- Parents are the first to mould the conduct and character of the child, the teachers at different levels have greater role in shaping every student to be useful not only to himself and his family but also to the society at large.
- " When money or material is lost, nothing is lost; but character is lost, everything is lost."

The ten commandments of Character:

- Joseph Telushkin, a Jewish Rabbi, in his book " *The Ten Commandments Of Character",* indicates the following as essential characteristics of an ethical person.

1. Know your weakness.
2. When ethics and other values conflict, choose ethics.
3. Treat all people with kindness, and with understanding that they, like you, are made in God's image.
4. Be fair.
5. Be courageous.
6. Be honest.
7. Be grateful.
8. Practice self-control.
9. Exercise common sense.
10. Admit when you have done wrong, seek forgiveness, and don't rationalize bad behavior.

Assignment-Cum-Tutorial Questions
UNIT-I
SECTION-A

Objective Questions

1. The word ethics is derived from Greek word----------
2. The word value comes from Latin word ----------
3. Ethics is also known as ---------- ---------
4. Define Integrity?
5. Define Engineering?
6. A written statement of policies and principles that guides the behavior of all employees is called [ ]
   a) Code of ethics b) Word of ethics c) Ethical dilemma d) None
7. We have the tendency to help a needy person due to ---------- [ ]
   a) Empathy b) Rewards c) Traits d) All
8. What matches the following definition " the relative strength of an individual's identification with and involvement in an organization"[ ]
   a) Organizational job satisfaction b) Organizational commitment
   c) Organizational citizenship d) Organizational intention
9. One of the major consequences of high self esteem is
   a) Good mental health
   b) Increased worker involvement on teams
   c) Increased absenteeism
   d) Decreased complaints from unionized workers
10. The time you spend on activities such as eating, sleeping, bathing, exercises and caring for your home is ---------- [ ]
    a) Committed time b) Discretionary time
    c) Maintenance time d) Family time
11. The essence of time management is taking charge of your life and not allowing ---------- to control you. [ ]

a) Poor study skills and habits b) Interruptions c) Distractions d) Anxiety

12. Which of the following factors shapes the ethical behavior of the members of an organization? [ ]
    a) The supervisor's behavior b) Organizational culture

c) Code of ethics d) All of the above

13. This time is yours to use as you please, use it for the things you value most in life. [ ]

a) Committed time b) Discretionary time

c) Maintenance time d) Family time

14. How do virtuous people differ from vicious people? [ ]

a) In their behavior b) In their thoughts

c) In their perceptions d) All of the above

15. The experience of feeling competent to cope with the basic challenges in life and of being worthy of happiness is [ ]

a) Arrogance b) Self-esteem c) Wishful thinking d) Self efficacy

SECTION-B

Descriptive Questions

1) What are the factors that shape Self confidence in a person?

2) What are morals values and ethics?

3) List the benefits of Empathy.

4) Write a note on time management.

5) What are the impediments to proper co-operation?

6) Define Service Learning and discuss on its components.

7) What are the four basic types of virtues?

8) Explain about Service Learning.

9) What is the importance of time management?

SECTION-C

C. Questions testing the analyzing / evaluating ability of students

1. Explain the behavioral values one should get exposed at work.

2. How an individual character was build?

3. What is your commitment in dealing a project?

ENGINEER & SOCIETY

UNIT – II

ENGINEER'S RESPONSIBILITIES AND RIGHTS

Objectives:

- To Inculcate the knowledge among the people on various safety measures towards risks.
- To Create awareness among the employers to know various techniques for collegiality.

Syllabus:

Safety and risk –Types of risks – Voluntary vs. Involuntary risk –Short Term vs. Long Term Consequences – Expected Probability – Reversible Effects – Threshold Levels for Risk – Delayed vs. Immediate Risk – collegiality – Techniques for achieving Collegiality- Two senses of Loyalty –Rights – Professional Responsibilities – Confidential and Proprietary information**.**

Outcomes:

Students will be able to

- Understand the concept of safety and risk
- Know how to assess safety and risk
- Know the responsibilities of engineers as employers
- Know the rights of employee as an engineer

LEARNING MATERIAL

SAFE: Protected from danger and harm

SAFETY: The ability to make (or) keep something safe.

CONCEPT OF SAFETY:

- We expect engineering projects not to do any harm to the man and the environment.
- What may be safe for one person, may not be safe for other person.

  Ex: A power saw in the hands of the child is unsafe, but it is safe in the hands of an adult.
- Safety means the various risks a person judges to be acceptable.

- According to William Lawarance "A thing is safe if its risks are judged to be acceptable".

UNDER ESTIMATE:

- EX: Toaster: We judge that is very safe and buy it.
  At home when we make toast using the toaster one receives severe electric shock and burn. So that he is hospitalized.
- Now we conclude that we were wrong in our earlier judgment.
- The toaster was not safe at all, that is its risks should not have been acceptable earlier.
- By Lawrance definition we are forced to say that prior to the accident the toaster was full safe, because at that time we judged the risks to be acceptable.

OVER ESTIMATE:

- We think fluoride in drinking water will kill a person.
- According to Lawrance definition the fluoride water is unsafe since we judge its risks are unacceptable.
- It is impossible for someone to prove that the water is actually safe.

NO JUDGEMENT:

- There is a situation in which people make no judgment at all, about the risks of things are acceptable (or) unacceptable.
- We normally say that some cars are safe and others are unsafe, many people never thing about the safety of cars they drive.

TYPES OF SAFETY:

1. **Normative Safety**: When the product design or services meets the given norms or design standards and protection, it is a case of normative safety.
2. **Substantive Safety:** Even if the safety norms are not met, if the past history is favourable, then it is a case of substantive safety.
3. **Perceived Safety:** If the users feel comfortable from a product or service, it is a case of perceived safety.
4. **Public Safety:** It is also called security offered to protect oneself from the risk of harm due to intentional criminal acts such as assault, burglary or vandalism.

RISK

DEFINITION:

The potential that something un wanted (or) harmful may occur. It is possibility of meeting a danger (or) suffering harm (or) loss.

TYPES OF RISKS:

1. Voluntary Vs Involuntary risk
2. Short term Vs Long term risk
3. Expected probability
4. Reversible effects
5. Threshold levels for risk
6. Delayed Vs Immediate risk

VOLUNTARY VS INVOLUNTARY RISKS

VOLUNTARY RISK

DEFINITION:

Hazardous associated with activities that one decides to understand on one's own.

- Many consider something safer if they knowingly take the risk.
- If the property values are low enough some people will be tempted to buy a house near a plant that emits low levels of a toxic waste into the air.
- They are willing to assume the risk for the benefit of cheap housing.
- However if a person already living near a plant finds that toxic fumes are emitted by the plant and he was not informed the risk will appear to be larger, since it was not voluntary assumed.

Ex: Smoking tobacco
Driving a car
Sky diving
Climbing a ladder

INVOLUTARY RISK

DEFINITON:

Carry negative impacts associated with an occurrence that happening to one without any notice

We do not have any control over involuntary risk.

Examples: Lightening

Tsunamis

Tornadoes

SHORT TERM VS LONG TERM CONSEQUENCES

DEFINITION:

Short term consequences are relatively comfortable to be managed.

Long term consequences can be handled professionally to minimize the resultant damage.

One should be alert to fore cast and protect oneself against all such consequences.

Examples:

1. Marine floods may destroy the fertility of the fertile lands for long time.
2. One of the builders when he found that the five staired building he was constructing sank in and collapsed, he promised all those who booked flats in a different location. Also he returned the amount received the amount received on booking with interest for those who did not show any interest to continue with that builders.

EXPECTED PROBABILITY:

DEFINITION:

Probability explains the chances of happening or non-happening of an event.

- Many persons might find a 1 in 1,00,0000 chances of severe injury of any kind to be an acceptable risk. Whereas 50-50 chances of somewhat minor injury might be unacceptable.
- Swimming at a beach where there is known to be a large concentration of jellyfish would be a high probability of a painful though rarely fatal sting.
- Yet at the same beach the risk of a shark attack is low enough that it does not deter anyone form swimming even though such an attack would very likely lead to death (or) dismemberment.

REVERSIBLE EFFECTS:

DEFINITION:

There are number of risks where the risk can be reversed through appropriate remedial measures.

Examples:

- Water pollution
- Air pollution
- Noise pollution

THERSHOLD LEVELS FOR RISK:

DEFINITION:

Something that is risky only at fairy high exposures will be safer than something with a uniform exposure to risk.

Examples:

- The probability of being in an automobile accident is the same regardless of how often you drive. You can reduce the likelihood of being in an accident by driving less often.
- Low levels of nuclear radiation actually beneficial effects on human health, while only at higher levels of exposure do death (or) severe health problems occur.

RISK DELAYED VS IMMEDIATE

DEFINTION:

- There are certain risks where the impact is not felt immediately. There are cases of delayed risk where things deteriorate from bad to worse and there could be loss of human life. It is also called an emergency. Where there is an immediate risk to health, human life, property or environment it is called as emergency.

- Those harm is delayed for many years will seem much less risky than something with an immediate effect.
  - **Examples:**

    American have been warned about the adverse long term health effects of a high fat diet. This type of diet can lead to chronic heart problems (or) stroke later in life.
  - Sky driving unacceptably risky since an accident will cause immediate injury (or) death.

COLLEGIALITY

DEFINITION:

It is a kind of connectedness rooted in respect for professional expertise and in commitment to the goals and values of the profession.

- It is the relationship between colleagues.
- Collegiality and loyalty are the two important virtues expected from any professional.

SOME IMPORTANT CORE ELEMENTS OF COLLEGIALITY:

1. Respect
2. Commitment
3. Connectedness
4. Co-operation

RESPECT:

Respect is valuing one's peers for their professional expertise and their devotion to the social goods promoted by the profession.

COMMITMENT:

Commitment means sharing devotion to the moral ideas inherent in the practice of engineering.

CONNECTEDNESS:

Connectedness is an awareness with a sense of unity, Co-operation ,mutual support with other engineers (or) professionals.

TECHNIQUES FOR ACHIEVING COLLEGIALITY:

1. Developing, recognization and articulation of shared values
2. Establishing /restoring a sense of professionalism
3. Vision
4. Defining expectations
5. Paying attention to structure
6. Paying attention to gender and diversity issues
7. Score keeping
8. Compensation
9. Trust
10. Practice are leadership
11. Selection process
12. Helpfulness
13. Balance of power
14. Partner evaluation
15. Problem partner
16. Business development

1. **DEVELOPMENT RECOGNITION AND ARTICULATION OF SHARED VALUES:**

   In many firms one can identify a handful of partners who are central to the collegiality of the organization. The attitudes and shared values of these partners become critically important to maintaining the desired environment.

2. **ESTABLISHING / RESTORING A SENSE OF PROFESSIONALISM:**

Leadership of a firm can restore a sense of professionalism regarding Client service

Example: Role of the lawyer in the resolution of disputes the conduct of business and the overall order of our society.

- How lawyers in the firm behave towards one another
    - The staff of firm
    - Their own clients
    - Adversary council
    - The courts

Government officials and the public at large matter greatly in establishing a culture of compatibility.

High standards should be established as part of what it means to be a lawyer in the firm. Lawyers who cannot behave in a professional manner destroy collegiality.

3. VISION:

The ability to think about (or) plan the future with imagination .Vision is a practical guide for creating plans, setting goals, objectives, making decisions, coordinating and evaluating the work on any project.

4. DEFINING EXPECTATIONS:

EMPLOYEES PROMISE TO:

1. Work hard
2. Uphold company reputation
3. Maintain high levels of attendance and punctuality
4. Show loyalty to the organization
5. Work extra hours when required
6. Develop new skills and update old ones
7. Be flexible for
8. Be honest
9. Be courteous to client and colleague
10. Come up with new ideas.

EMPLOYERS PROMISE TO PROVIDE:

1. .Pay commensurate with performance.
2. Opportunities for training and development
3. Opportunities for promotion

4. Recognition for innovation (or) new idea
5. Feed back on performance
6. Interesting tasks
7. An attractive benefits package
8. Respectful treatment
9. Reasonable job security
10. A pleasant and safe working environment.

5. PAYING STRUCTURE:ATTENTION TO :

Some firms are utilizing contract arrangements

Examples: senior counsel

Contract attorney

Contract partner

These arrangements may permit a firm to retain a valuable lawyer who has been trained by the firm, without diluting (or) over expanding the partnership.

6. PAYING ATTENTION TO GENDER AND DIVERSITY ISSUES:

- Collegiality can be enhanced by the firm deals with issues of gender and diversity.
- Is the firm really committed to equal opportunity hiring.
- Are opportunities within the firm really fairly open without regard to race and gender.
- Openness and commitment to fairness is important in establishing a collegial environment.
- More over a firm which has women and minorities in important positions will have significant advantages in attracting business.

7. SCORE KEEPING:

- Score keeping practices frequently evolve in response to the demands by strong partners and should be examined periodically.
- Score keeping practice should be clearly articulated and understood and open for discussion.

8. COMPENSATION:

- Motivate partners to perform in ways that maximize firm profits and to cause the firm to achieve its objectives.
- Reward performance and contribution
- Solidify the ties with partners who are critical to the ongoing success of the institution

9. TRUST:

The vast majority of partners in firms are hardworking
Ethical
Competent and
Honest

- There should be an atmosphere of trust among partners and between the management of the firm and its partners.
- The necessity of rules and procedures should be carefully examined and there should be a distinct bias against controls on partner behavior.

10. PRACTICE AREA LEADERSHIP:

Although there are many who have been very successful impracticing law the complexity of issues

- The need for specialized expertise
- The work demands of the profession
- Generate significant pressure to utilize practice groups in day to day law firm operations.

11. SELECTION PROCESS:

- Compatibility factors including weather the individual is a team player
- Should be considered in virtually every decision involving lawyers of new associates
- In decisions to make associates partners
- In the decision to make non equity partners equity partners
- In the selection of leaders of the firm.

12. HELPFULNESS:

Recognition of helpfulness by firm management through compensation and other forms of recognition is extremely important.

13. BALANCE OF POWER:

On the theory that power corrupts and absolute power corrupts absolutely law firms should consciously seek balance of economic power within the firm.

14. PARTNER EVALUATION:

Partner evaluation can be used to deliver otherwise hand to deliver messages and to communicate praise and appreciation.

15. PROBLEM PARTNER:

The firms approach to dealing with problem partners is highly relevant to its overall collegiality and it its value.

16. BUSINESS DEVELOPMENT:

An important technique is establishing and maintain a collegial environment is to have team marketing focusing on particular industries (or) clients.

COLLEGIALITY

CHARACTERISTICS:

1. Engineers should not attempt to injure unkindly (or) falsely directly (or) indirectly the professional reputation, prospects, practice (or) employment of other engineers.
2. Engineers should not untruth full criticize other engineer's work.
3. Engineers should bring unethical (or) illegal practice of other engineers to the proper authority for action.
4. Collegiality should be encouraged among engineers and other professionals because it the influential value to promote the aims of professions.
5. It supports personal efforts act responsibly in concert with colleagues.
6. It strengthen ones motivation to live up to professional standards.

It is more valuable as many individuals jointly working for the goodness of the public and society.

TWO SENSES OF LOYALTY

DEFINTION:

Loyalty is the allegiance to the sovereign (or) establishment of one's country.

Loyalty is a faithfulness or a devotion to a person, country, group (or) cause.

TWO SENSES OF LOYALTY:

1. AGENCY LOYALTY
2. IDENTIFICATION LOYALTY

AGENCY LOYALTY:

It is acting to fulfill one's contractual duties to an employer.

The contractual duties may include particular task for which one is paid general activities of co-operating with colleagues and following lawful authority with the organization.

Example:

people may not like the job they do hate their employer but still they would perform their duty as long as they are employees. This sense of loyalty is agency loyalty.

IDENTIFICATION LOYALTY:

It is much concerned with attitudes emotions and a sense of personal identity as it dies with action.

Employee should meet his moral duties to the organization willingly with personal attachment and affirmation.

SOME DUTIES OF LOYAL EMPLOYEES

- To avoid conflicts of interest
- To protect confidential information
- To be honest in making estimates
- To admit one's error

OBLIGATIONS OF LOYALITY:

Agency loyalty to employers is an obligation

Identification loyalty to an employer is not so

Rather a professional has to be responsible and discharge his duties to the best of his ability to his organization.

Identification loyalty is a commendable one without being obligations.

In an organization in which identification royalty exist among the professional will lead to an increase in the productivity

OBLIGATION: The state of being forced to do something because it is your duty.

OBLIGATORY: That you must do because of law.

PROFESSIONLA RIGHTS

1. Right to form and express professional judgment
2. Right to refuse to participate in unethical activities.
3. Right to warn with public about dangers
4. Right to fair recognition far fair professional services.
5. Right to talk public about the job within the confidentiality ethics
6. Right to engage in the activities of professional societies.

RIGHTS CAN BASICALLY CLASSIFIED INTO FOUR:

- Right to recognition
- Right to professional conscience
- Right to acquired as a part of the contractual terms entered upon
- Right as a human being

RIGHT TO RECOGNITION:

- Engineers have a right to professional recognition for their work and accomplishments.
- Part of this involves fair monetary remuneration and a part of nonmonetary forms of recognition.
- Right to recognition is not sufficiently precise to pinpoint just what a reasonable salary is (or) what a fair remuneration for patent discoveries is.
- Such detailed matters must be worked out co-operatively between employers and employees.

RIGHT OF PROFESSIONAL CONSCIENCE:

- There is a basic and generic profession right of engineer, the moral right to exercise responsible professional judgement in pursuing professional responsibilities.
- Pursuing these responsibilities involves exercising both technical judgement and reasoned moral convictions.

RIGHT AS AN EMPLOYEE:

- Right to receive salary
- Right a casual leaves
- On duty leave
- Academic leave
- Earned leaves
- Maternity leave
- Medical leave
- Sabbatical leave
- Extra ordinary leave on loss of pay
- Service benefits
- Privacy
- Right to choose outside activities
- Due process from employer
- Equal opportunity –Non discrimination
- Right to equal opportunity
- Affirmative action

BASIC HUMAN RIGHTS:

- Right to equality
- Right to freedom
- Right against exploitation
- Right to freedom of religion
- Cultural and educational rights
- Right to constitutional remedies

MORE SPECIFIC PROFESSIONAL RESPONSIBILITIES:

- Strive to achieve the highest quality effectiveness and dignity in both the process and products of professional work.
- Acquire and maintain professional competence
- Know and respect existing laws pertaining to professional work.
- Accept and provide appropriate professional
- Give comprehensive and through evaluations of computer systems and their impacts including analysis of possible risks.
- Improve public understanding of computing and its consequences
- Access computing and communication resource only when authorized to do so.

CONFIDENTIALITY

DEFINITION:

Confidential information is the information which is desirable to keep secret in a government department (or) a private company.

- Keeping confidentiality is the most important duty of any professional.
- Lawyers must keep clients information confidential.
- Doctors must keep information about their patients confidential
- Teachers must keep personal information about their students confidential
- Engineers must keep information about their companies and clients confidential
- They are expected not to leak out any confidential information to unauthorized people both inside and outside the company
- Any information which is to be kept as confidential if it is known to others it will cause harm to the corporation (or) clients.
- Any information to keep secret in order to compete effectively against business rivals, is known as confidential information.

CONFIDENTIALITY RELATED TERMS:

1. PRIVILEGED INFORMATION
2. PROPRIETARY INFORMATION

PRIVILEGED INFORMATION:

It is similar expression for confidential information

- Privileged information means the information that will be available only on the basis of special privileged.
- Special privilege means the privilege accorded to an employee working on a special assignment.
- It covers information that has not become public (or) widely known within an organization.

PROPRIETARY INFORMATION:

Proprietary information is an information that a company owners. It is the information owned by the proprietor in a legal sense. This means property (or) ownership.

Assignment-Cum-Tutorial Questions
UNIT-II
SECTION-A

Objective Questions

1. Match the following:

Happening / Non-Happening Risk	[ ]	Voluntary Risk
Smoking tobacoo	[ ]	Involuntary Risk
T sunami	[ ]	Reversible effects
Water Pollution	[ ]	Expected Probability

2. "Risk" is defined as [ ]
   a) Hazard b) Danger c) Exposure to mis change / Peril d) All the above
3. Safety engineer does: [ ]
   a) Protection of people b) Misusage of Resources
   c) Harsh behavior d) Goods without quality
4. _____is the realistic approach that can protect you organization from loss through efficiency [ ]
   a) Risk appetite b) Risk Threshold c) Voluntary Risk d) Long term Risk
5. _____accidents takes place for different reasons like [ ]
   a) Negligence b) Carelessness
   c) Ignorance – Insufficient Knowledge d) All the above
6. _____vizag steel plant -2012 tragedy takes place because of [ ]
   a) Negligence of workers b) Inadequate Equipments
   c) Equipment failure d) Milead of Engineer
7. _____What you want to achieve immediately say next five years [ ]
   a) Vision b) Compassion c) Mission d) Perseverance
8. _____Loyalty placed in persons or organizations where loyalty is not respected [ ]
   a) Agency loyalty b) Misguided loyalty c) Identification loyalty d) None
9. _____Confidentiality related to [ ]
   a) Privileged Information b) loyalty obligations
   c) Basic Human Rights d) Professional rights
10. Proprietary information which means [ ]
    a) Illegal act b) Proprietor in a legal sense

c) unauthorized d) Professional services

SECTION-B

Descriptive Questions

SHORT ANSWER QUESTIONS:

1. Compare safety and risks?
2. What is meant by safe exist in industries
3. What are the methods to control risk
4. What is meant by voluntary risk? How can a product be tested for safety
5. Write briefly on loyalty as professional obligation
6. What is meant by the term confidential information and how can we justify what data should be kept confidential?
7. What are the central elements of collegiality?
8. What is the relationship between the loyalty to the company and professional responsibility to the public

ESSAY QUESTIONS:

1. What are the methods of risk assessment.
2. What are the different types of risks, how they can be contained.
3. Compare the reasons and safety issues involved in Bhopal gas tragedy.
4. How do you identify risk and manage them.
5. “A person who is loyal has respect for authority.” Discuss.
6. Discuss the need for collegiality for an engineer working in an organization.
7. What is the importance of “loyalty and collegiality” in a team work?
8. What are the responsibilities of engineers for serving the society as responsible experimenters?
9. Discuss in detail about the employee rights.
10. Explain related terms of confidentiality.

UNIT-III

GLOBAL CLIMATIC ISSUES AND ITS MITIGATION STRATEGIES

OBJECTIVES:

- To create awareness among the people to know about various environmental issues and mitigation measures.

Syllabus:

Greenhouse effect – global warming – acid rain – ozone layer depletion – International efforts-key initiatives of Montreal protocol, Rio declaration, Kyoto protocol, Johannesburg summit.

Learning Outcomes:

Students are able to

- identify causes and consequences of climatic issues.
- identify causes of global warming.
- adopt control measures towards global warming.
- find out major causes of acid rain.
- examine various effects of ozone layer depletion.
- know the importance of conventions.

Learning material

CLIMATE CHANGE

Climate is the average weather of an area. It is the general weather Conditions, seasonal variations and extremes of weather in a region, such conditions which average over a long period- at least 30 years is called climate.

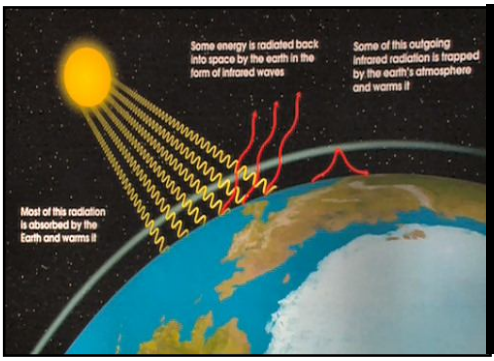
- **The Intergovernmental Panel on Climate Change (IPCC)**

In 1990 and 1992 it published the best available evidences about past climate change, the greenhouse effect and recent changes in global temperature

GLOBAL WARMING

Troposphere, the lowest layer of the atmosphere, traps heat by a natural - process due to the presence of certain gases. This effect is called Green House Effect.

It is similar to the warming effect observed in the horticultural greenhouse made of glass.



Greenhouse effect Global warming

The amount of heat trapped in the atmosphere depends mostly on the Greenhouse Gases.

Carbon dioxide

1. It contributes about 55% to global warming from greenhouse gases produced by human activity.
2. The main sources are fossil fuel burning(67%) and deforestation, other forms of land clearing and burning(33%).

3. CO2 stays in the atmosphere for about 500 years.
4. CO2 concentration in the atmosphere was 355 ppm in 1990 that is increasing at a rate of 1.5 ppm every year.

Chlorofluorocarbons (CFCs)

1. These are believed to be responsible for 24% of the human contribution to greenhouse gases.
2. The main sources of CFCs include leaking air conditioners and refrigerators, evaporation of industrial solvents, production of plastic foams, aerosols, propellants etc.
3. CFC's stays in atmosphere 65 to 110 years.
4. Atmospheric concentration of CFC is 0.00225 ppm that is increasing at a rate of0.5% annually.

Methane (CH4)

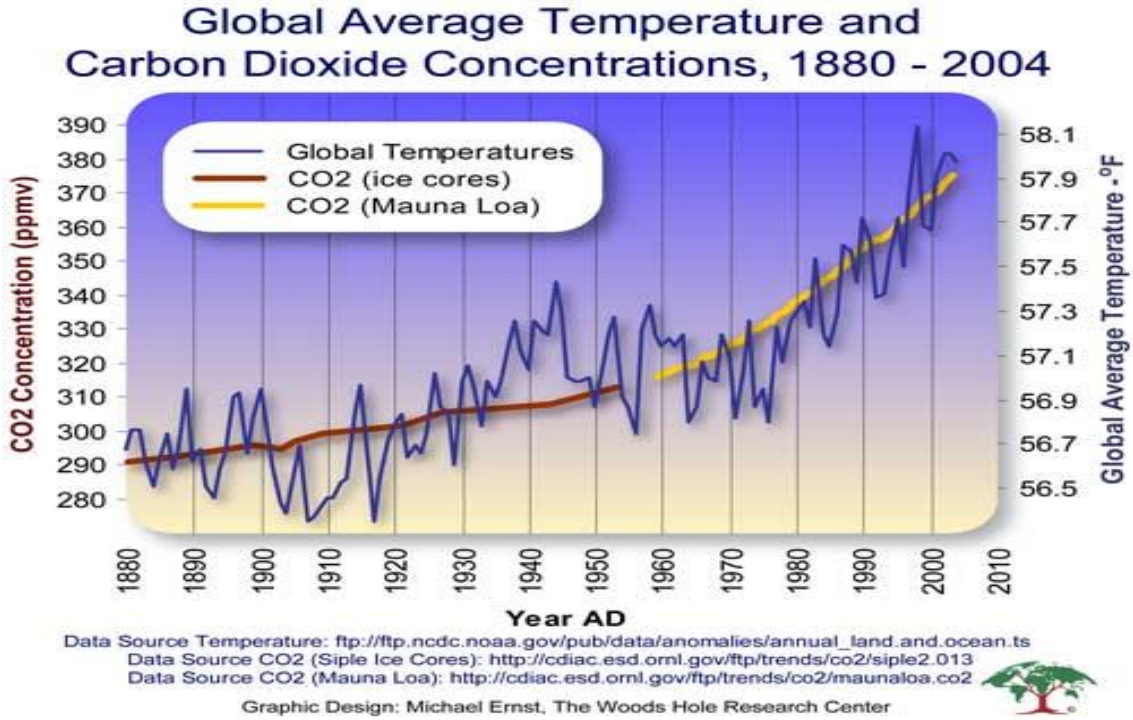
1. It accounts for 18% of the increased greenhouse gases.
2. Methane is produced when bacteria break down dead organic matter in moist places that lack oxygen such as swamps, natural wetlands, paddy fields, landfills and digestive tracts of cattle, sheep and termites.
3. Production and use of oil and natural gas and incomplete burning of organic material are also significant sources of methane.
4. Methane stays in the atmosphere for 7-10 years.
5. Atmospheric concentration of methane is 1.675 ppm and it is increasing at a rate of 1% annually.

Nitrous Oxide (N_2O)

1. It is responsible for 6% of the human input of greenhouse gases.
2. It is released from nylon products, from burning of biomass and nitrogen rich fuels (especially coal) and from the breakdown of nitrogen fertilizers in soil, livestock wastes and nitrate contaminated ground water.
3. Its life span in the troposphere is 140-190 years
4. Concentration of N2O is 0.3 ppm and is increasing at a rate of 0.2% annually.

Impacts of Enhanced Greenhouse Effect

(i) Global temperature increase: It is estimated that the earths mean temperature rises between 1.5 to 5.5°C by 2050.



(ii) Rise in Sea Level: With the increase in global temperature, seawater expands. Heating melts the polar ice sheets and glaciers resulting in further rise in sea level.

(iii) Effects on Human Health: The global warming leads to changes in the rainfall pattern in many areas, thereby affecting the distribution of vector-borne diseases like malaria, filariasis, elephantiasis etc.

(iv) Effects on Agriculture: There are different views regarding the effect of global warming on agriculture.

Measures to Check Global Warming

(i) Cut down the current rate of use of CFCs and fossil fuel.

(ii) Use energy more efficiently.

(iii) Shift to renewable energy resources.

(iv) Increase Nuclear Power Plants for electricity production.

(v) Shift from coal to natural gas.

(vi)Trap and use methane as a fuel.

(vii) Reduce beef production.

(viii) Adopt sustainable agriculture.

(ix) Stabilize population growth.

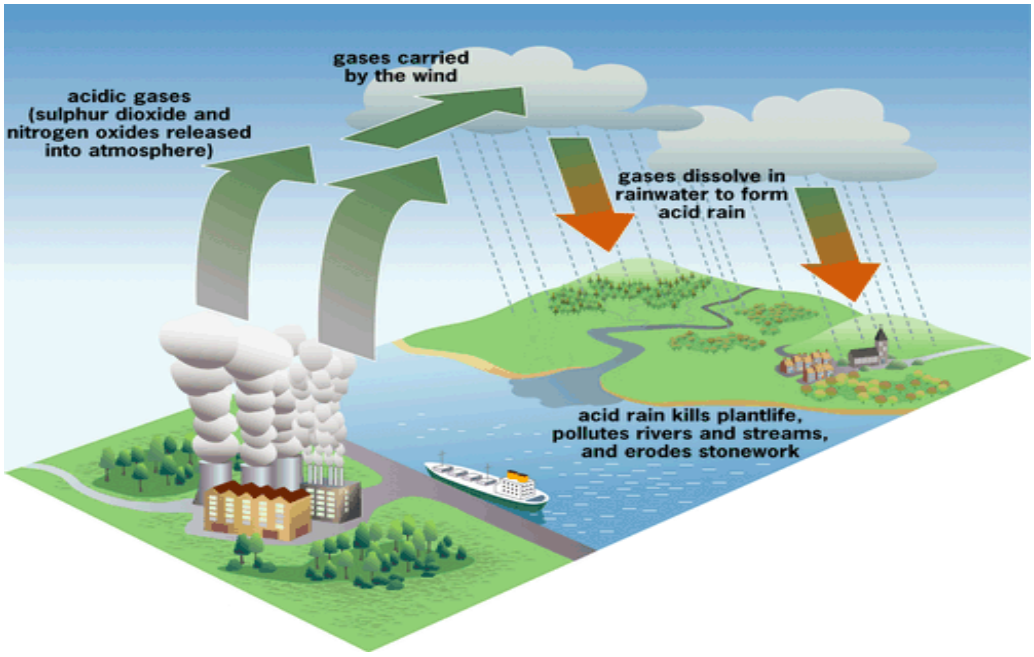
(x) Efficiently remove CO2 from smoke stacks.

(xi) Plant more trees.

(xii) Remove atmospheric CO2 by utilizing photosynthetic algae.

ACID RAIN

Acid rain was discovered in the 1800's in Great Britain.The formation of sulphuric acid and nitric acid as a secondary pollutant in the atmosphere which is called acid rain.



Mechanism of Formation of Acid rain:

Mechanism of formation of Sulphuric acid:

$$S + O_2 \rightarrow SO_2$$

$$2SO_2 + O_2 \rightarrow 2SO_3$$

$$SO_3 + H_20 \rightarrow H_2SO_4$$

Mechanism of formation of Nitric Acid

$$O_3 + NO_2 \rightarrow NO_3 + O_2$$

$$NO_3 + NO_2 \rightarrow N_2O_5$$

$$N_2O_5 + H_20 \rightarrow 2HNO_3$$

Measuring Acid rain:

Acid rain is measured using pH scale. Lesser value of pH indicates more acidity. Pure water has a value of 7.0. Normal rain is slightly acidic , with a pH value of 5.6, because carbon dioxide dissolves into it.

Effects of acid rain:

1. Acid rain causes a number of harmful effects below pH 5.1. The effects are visible in the aquatic system even at pH less than 5.5.
2. It causes deterioration of buildings especially made of marble e.g. monuments like Taj Mahal Crystals of calcium and magnesium sulphates are formed as a result of corrosion caused by acid rain.
3. It damages stone statues. Priceless stone statues in Greece and Italy have been partially dissolved by acid rain.
4. It damages metals and car finishes.
5. Aquatic life especially fish are badly affected by lake acidification.
6. Aquatic animals suffer from toxicity of metals such as aluminium, mercury, manganese, zinc and lead which leak from the surrounding rocks due to acid rain.
7. It results in reproductive failure, and killing of fish.
   Many lakes of Sweden, Norway, Canada have become fishless due to acid rain.
8. It damages foliage and weakens trees.
9. It makes trees more susceptible to stresses like cold temperature, drought etc.
10. Many insects and fungi are more tolerant to acidic conditions and hence they can attack the susceptible trees and cause diseases.

Effects on vegetation

Effects on aquatic life

Effects on buildings and monuments

Control of Acid Rain

1. Emission of SO2 and NO2 from industries and power plants should be reduced by using pollution control equipments.
2. Liming of lakes and soils should be done to correct the ad-verse effects of acid rain.
3. A coating of protective layer of inert polymer should be given in the interior of water pipes for drinking water.

OZONE LAYER DEPLETION

Ozone is a form of oxygen. The molecule of oxygen contains two atoms whereas that of ozone contains three (O3). In the stratosphere ozone is continuously being created by the absorption of short wave-length ultraviolet (UV) radiations. Ultraviolet radiations less than 242

nanometers decompose molecular oxygen into atomic oxygen (O) by photolytic decomposition

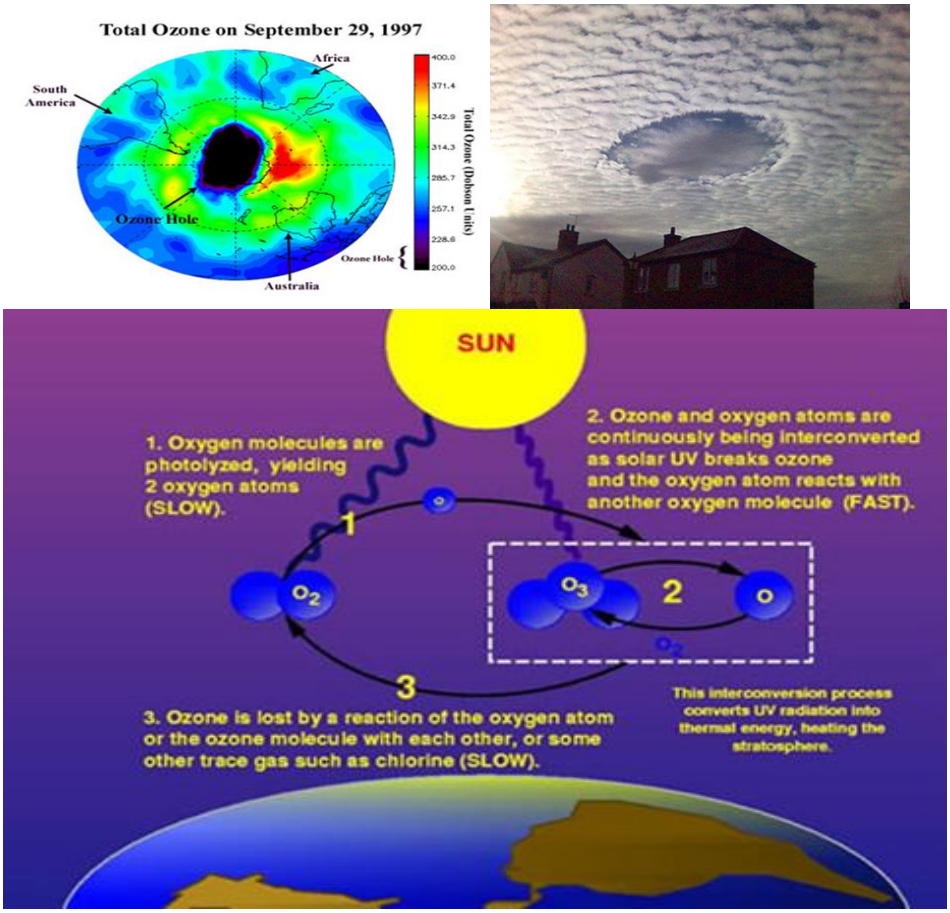
$$O2 + hv(\text{photolytic decomposition}) \rightarrow O + O$$

The atomic oxygen rapidly reacts with molecular oxygen to form ozone.

O + O2 + M (M is a third body necessary to carry away the energy released in the reaction)→O3 +M

Thinning of Ozone Layer

The Antarctic ozone hole was discovered by Dr Joe C. Farman and his colleagues



Chlorofluorocarbons (CFC) are mainly responsible for ozone depletion in the stratosphere. CFCs are a group of synthetic chemicals first discovered by Thomas Midgley Jr. in 1930. CFC-11 and CFC-12 are the CFCs most commonly used. CFCs are used as coolants in refrigerators and air conditioners, as propellants, cleaning solvents, sterilant and in styrofoam

etc. CFCs released in the troposphere reach the stratosphere and remain there for 65-110 years destroying O3 molecules. Nitrous oxide emitted by supersonic aircrafts, during combustion of fossil fuel and use of nitrogen fertilizers breaks ozone molecules.

Dobson Unit:

- Dobson Unit (DU) is the scale for measuring the total amount of ozone occupying a column overhead.
- One Dobson unit (1DU) is defined as 0.01mm at 0^0C and 1 atmospheric pressure.
- G.M.B.Dobson designed the Dobson Spectrophotometer instrument to measure ozone layer thickness.

Effects of Ozone Depletion

1. Ozone depletion in the stratosphere will result in more UV radiation reaching the earth especially UV-B (290-320 nm). The UV-B radiations affect DNA and the photosynthetic chemicals. Any change in DNA can result in mutation and cancer. Cases of skin cancer (basal and squamous cell carcinoma) which do not cause death but cause disfigurement will increase.
2. Easy absorption of UV rays by the lens and cornea of eye will result in increase in incidents of cataract.
3. Melanin producing cells of the epidermis (important for human immune system) will be destroyed by UV-rays resulting in immuno-suppression. Fair people (can't produce enough melanin) will be at a greater risk of UV exposure.
4. Phytoplanktons are sensitive to UV exposure. Ozone depletion will result in decrease in their population thereby affecting the population of zooplankton, fish, marine animals, in fact the whole aquatic food chain.
5. Yield of vital crops like corn, rice, soybean, cotton, bean, pea, sorghum and wheat will decrease.

6. Degradation of paints, plastics and other polymer material will result in economic loss due to effects of UV radiation resulting from ozone depletion.

Control measures:

1. Use of CFC's free refrigerators.
2. Reduce the use of aerosol sprays.
3. Use HFC's instead of CFC's.
4. Use of bio-fertilizers instead of chemical fertilizers.
5. Reduce the use of fossil fuels.
6. Use of air pollution controlling equipments.

KEY INITIATIVES:

MONTREAL PROTOCOL:

In 1985 representatives of nearly two dozen nations met to consider what should be done to protect the ozone layer. The result was a series of conferences are meetings that culminated in 16 September 1987. At a meeting hosted by the Canadian government in Montreal, representatives from 24 industrialized countries agreed to freeze CFC and Halon production to 50% .

RIO DECLARATION:

The **Rio Declaration** on environment and development was approved by the United Nations during the Conference on Environment and Development held in **Rio** de Janeiro on June 1992. It was aimed at reaffirming the **Declaration** of the United Nations Conference on the Human Environment, adopted at Stockholm on June 1972.

KYOTO PROTOCOL:

A protocol to the United Nations Framework Convention on Climate Change.The Convention entered into force on 21 march 1994. Its purpose is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous human-induced interference with the climate system.

JOHANNESBURG SUMMIT:

The **Johannesburg Declaration on Sustainable Development** was adopted at the World Summit on Sustainable Development (WSSD), sometimes referred to as **Earth Summit 2002**, at which the **Plan of Implementation of the World Summit on Sustainable Development** was also agreed upon. 30yrs ago, Stockholm conference was introduced for human environment and later after 10yrs united nation declaration on environment and development was introduced.

The Johannesburg Declaration builds on earlier declarations made at the United Nations Conference on the Human Environment at Stockholm in 1972, and the Earth Summit in Rio de Janeiro in 1992. While committing the nations of the world to sustainable development, it also includes substantial mention of multilateralism as the path forward.

In terms of the political commitment of parties, the Declaration is a more general statement than the Rio Declaration. It is an agreement to focus particularly on "the worldwide conditions that pose severe threats to the sustainable development of our people, which include: chronic hunger; malnutrition; foreign occupation; armed conflict; illicit drug problems; organized crime; corruption; natural disasters; illicit arms trafficking; trafficking in persons; terrorism; intolerance and incitement to racial, ethnic, religious and other hatreds; xenophobia; and endemic, communicable and chronic diseases, in particular HIV/AIDS, malaria and tuberculosis." Johannesburg Declaration 19

Assignment-Cum-Tutorial Questions
UNIT-III
SECTION-A

Objective Questions

1. In acid rain, the pH of rain water falls below**.....**
2. The atmospheric emission of NO_2 and .....cause acid rain.
3. Ozone layer acts as a natural sunscreen which protects life on this earth against **.....**rays.
4. Ozone concentration is measured in **.....**units.
5. Which of the following gas has maximum contribution to enhanced greenhouse effect? [ ]
   a) CFC's (b) CH_4 (c) CO_2 (d) N_2O
6. Cattle, sheep and termites are responsible for the release of the following greenhouse gas [ ]
   (a)CH_4 (b) CO_2 (c) N_2O (d) All the above
7. The most important agents for ozone depletion are [ ]
   (a)CH_4 (b) CFC's (c) Nuclear fallout (d) N_2O
8. Maximum depletion of ozone occurs on [ ]
   (a) Equator (b) North pole (c) South pole (d) Tropics
9. Chernobyl disaster is associated with [ ]
   (a) Nuclear accident (b) Landslides (c) Earthquakes (d) Acid rain
10. The international protocol to protect the ozone layer is [ ]
    (a)the Montreal Protocol (b)the Vienna protocol
    (c)Kyoto protocol (d) Cartagena Protocol

SECTION-B

Descriptive Questions

Short answer questions

1) Define climate.
2) What is climate change?
3) Define greenhouse effect.
4) What is global warming?

5) Define acid rain.
6) Write effects for ozone layer depletion.
7) Write about Kyoto protocol.
8) Write about Rio declaration.

Essay type questions

1. Identify causes and consequences of Global warming.
2. Show effects of Acid rain.
3. Identify causes of ozone layer depletion.
4. Choose remedial measures for Acid rain and ozone layer depletion.
5. As an individual what can you do to alleviate the ozone hole problem?
6. What are the remedial measures that an individual has to take to reduce global warming?
7. Explain about Montreal protocol and Johannesburg summit.

Engineer & Society

Unit-IV

Future challenges to society

Objectives:

- To create awareness among the people on various sustainable development practices.

Syllabus:

Sustainable development – Measures for sustainable development – Water conservation practices – Rain water harvesting methods- Watershed management – Resettlements and Rehabilitation of people- waste land reclamation – Role of information technology- Role of an engineer in mitigating societal problems.

Learning Outcomes:

Students are able to

- Classify sustainable development measurements.
- Analyze Rain water harvesting.
- Distinguish between Rain water harvesting and Watershed management
- Categorize water conservation practices.
- Implement various wasteland reclamation practices
- Examine rehabilitation and resettlement issue
- Know the importance of information technology in protection of environment.

Learning material

Sustainability:

Definition: Sustainable development is defined as .meeting the needs of the present without compromising the ability of future generations to meet their own needs

Measures for Sustainable Development: Some of the important measures for sustainable development are as follows:

l. Using appropriate technology is one which is locally adaptable, Eco-friendly, resource-efficient and culturally suitable.

2. **Reduce, Reuse, and Recycle approach:** The 3-R approach advocating minimization of resource use, using them again and again instead of passing it on to the waste stream and recycling the materials goes a long way in achieving the goals of sustainability.

3. Prompting environmental education and awareness: Making Environmental education the centre of all learning process will greatly help in changing the thinking and attitude of people towards our earth and the environment. Introducing the subject right from the school stage will inculcate a feeling of belongingness to earth in the small children.

4.Resource utilization as per carrying capacity: Any system can sustain a limited number of organisms on a long-term basis which is known as its carrying capacity.

Rainwater Harvesting

Rainwater harvesting is a technique of increasing the recharge of groundwater by capturing and storing rainwater. This is done by constructing special water-harvesting structures like dug wells, percolation pits, lagoons, check dams etc.

Traditional Rain Water Harvesting

In India, it is an old practice in high rainfall areas to collect rainwater from roof-tops into storage tanks. In foot hills, water flowing from springs is collected by embankment type water storage. In Himalayan foot-hills people use the hollow bamboos as pipelines to transport the water of natural springs.

Modern Techniques of Rain Water Harvesting

In arid and semi-arid regions artificial ground water recharging is done by constructing shallow percolation tanks. Check-dams made of any suitable native material (brush, poles, rocks, plants, loose rocks, wire nets, stones, slabs, sacks etc.) are constructed for harvesting runoff from large catchment areas.

Rajendra Singh of Rajasthan popularly known as “water man” has been doing a commendable job for harvesting rainwater by building check dams in Rajasthan and he was honored with the prestigious Magsaysay Award for his work.

Watershed Management Practices

(i) Water harvesting: Proper storage of water is done with provision for use in dry seasons in low rainfall areas. It also helps in moderation of floods.

(ii) Afforestation and Agro forestry: In watershed development, Afforestation and crop plantation play a very important role. They help to prevent soil erosion and retention of moisture. In high rainfall areas woody trees are grown in between crops to substantially reduce the runoff and loss of fertile soil.

(iii) Mechanical measures for reducing soil erosion and runoff losses: Several mechanical measures like terracing, bunding, bench terracing, no-till farming, contour cropping, strip cropping etc. are used to minimize runoff and soil erosion particularly on the slopes of watersheds.

(iv) Scientific mining and quarrying: Due to improper mining, the hills lose stability and get disturbed resulting in landslides, rapid erosion etc. Contour trenching at an interval of 1 meter on overburden dump, planting some soil binding plants like Ipomoea and Vertex and draining of water courses in the mined area are recommended for minimizing the destructive effects of mining in watershed areas.

(v) Public participation: People's involvement including the Farmers and tribal is the key to the success of any watershed management programme, particularly the soil and water conservation.

Water Conservation

(i) Decreasing run-off losses:

(a) Contour cultivation: on small furrows and ridges across the slopes trap rainwater and allow more time for infiltration. Terracing constructed on deep soils has large water-storage capacity. On gentle slopes trapped run off is spread over a large area for better infiltration.

(b) Conservation-bench terracing involves construction of a series of benches for catching the runoff water.

(c) Water spreading is done by channeling or lagoon-leveling. In channeling, the water-flow is controlled by a series of diversions with vertical intervals. In lagoon leveling, small depressions are dug in the area so that there is temporary storage of water.

(d) Chemical wetting agents (Surfactants) increase the water intake rates when added to normal irrigated soils.

(e) Surface crop residues, Tillage, mulch, animal residues etc. Help in reducing run-off by allowing more time for water to penetrate into the land.

(f) Chemical conditioners like gypsum ($CaSO_4.2H_2O$) when applied to sodic soils improve soil permeability and reduce run off. Another useful conditioner is HPAN (hydrolyzed poly acrylo nitrile).

(g) Water-storage structures like farm ponds, dug-outs etc. built by individual farmers can be useful measures for conserving water through reduction of runoff.

(ii) Reducing evaporation losses: This is more relevant in humid regions. Horizontal barriers of asphalt placed below the soil surface increase water availability and increase crop yield by 35-40%. This is more effective on sandy soil but less effective on loamy sand soils. A co-polymer of starch and acrylo nitrile called .super slurper. Has been reported to absorb water up to 1400 times its weight. The chemical has been found to be useful for sandy soils.

(iii) Storing water in soil: Storage of water takes place in the soil root zone in humid regions when the soil is wetted to field capacity. By leaving the soil fallow for one season water can be made available for the crop grown in next season.

(iv) Reducing irrigation losses

1. Use of lined or covered canals to reduce seepage.
2. Irrigation in early morning or late evening to reduce evaporation losses.
3. Sprinkling irrigation and drip irrigation to conserve water by 30-50%.
4. Growing hybrid crop varieties with less water requirement and tolerance to saline water help conserve water.

(v) Re-use of water

Treated wastewater can be used for ferti-irrigation. Using grey water from washings, bath-tubs etc. for watering gardens, washing cars or paths help in saving fresh water.

(vi) Preventing wastage of water: This can be done in households, commercial buildings and public places. Closing taps when not in use, repairing any leakage from pipes, using small capacity flush in toilets.

(vii)Increasing block pricing: The consumer has to pay a proportionately
Higher bill with higher use of water. This helps in economic use of water by the consumers.

Rehabilitation and Resettlement of People

Rehabilitation Issues:

The United Nations Universal Declaration on Human Rights [Article 25(1) has declared that right to housing is a basic human right.

In India most of the displacements have resulted due to land acquisition by the government for various reasons. For this purpose the government has the Land Acquisition Act, 1894 which empowers it to serve notice to the people to vacate exists in section 16 of the Act. The major issues related to displacement and rehabilitation is as follows:

(i) Tribal's are usually the most affected amongst the displaced who are already poor. Displacement further increases their poverty due to loss of land, home, jobs, food insecurity, loss of access to common property assets, increased morbidity and mortality and social isolation.

(ii) Break up of families is an important social issue arising due to displacement in which the women are the worst affected and they are not even given cash/land compensation.

(iii) The tribal's are not familiar with the market policies and trends, Even if they get cash compensation they get alienated in the modern economic set-up.

(iv) The land acquisition laws ignore the communal ownership of property, which is an inbuilt system amongst the tribal's. Thus the tribal's lose their communitarian basis of economic and cultural existence. They feel like fish out of water.

(v) Kinship systems, marriages, social and cultural functions, their folk-songs, dances and activities vanish with their displacement. Even when they are resettled, it is individual-based resettlement, which totally ignores communal settlement.

(vi) Loss of identity and loss of the intimate link between the people and the environment is one of the biggest losses. The age-long indigenous knowledge, which has been inherited and experienced by them about the flora, fauna, their uses etc, gets lost.

Waste Land Reclamation Practices

Definition: Economically unproductive land suffering from environmental deterioration is known as wastelands.

Sources:

Salt effected lands

Sandy areas

Gullied areas

Undulating uplands

Barren hill-ridge

Snow covered areas

Glacial areas, areas rendered barren after Jhum cultivation

Deforestation

Overgrazing

Mining and erroneous agricultural practices etc,

Waste Land Reclamation Practices:

Waste land reclamation and development in our country falls under the purview of Wasteland Development Board, which works to fulfill the following practices:

- To improve the physical structure and quality of the marginal soils.
- To improve the availability of good quality water for irrigating these lands.
- To prevent soil erosion, flooding and landslides
- To conserve the biological resources of the land for sustainable use.

Some of the important reclamation practices are discussed here:

(i) Land development and leaching:

For reclamation of the salt affected soil, it is necessary to remove the salts from the root-zone which is affected by leaching i.e. by applying excess amount of water to push down the salts. After survey of the extent of salinity problem, soil texture, depth of impermeable layer and water table, land leveling is done to facilitate efficient and uniform application of water. After leveling and ploughing, the field is bunded in

small plots and leaching is done. In continuous leaching, 0.5 to 1.0 cm of water is required to remove 90% soluble salts from each cm of soil depending upon texture. If we use intermittent sprinkling with 25cm water, it reduces about90% salinity in the upper 60 cm layer.

(ii) **Drainage:** This is required for water-logged soil reclamation where excess water is removed by artificial drainage.

(a) **Surface drainage:** This is used in areas where water stands on the fields after heavy rains by providing ditches to runoff the excess water. Usually 30-45cm deep ditches are able to remove 5 cm of water within 24 hours.

(b) **Sub-surface drainage** Horizontal sub-surface drainage is provided in the form of perforated corrugated PVC pipes or open-jointed pipes with an envelope of gravel 2-3m below the land surface. Chances of evaporation of water leading to accumulation of salts almost become nil in this method.

The World Bank has funded sub-surface drainage system at Sampla, Rohtak (Haryana) for reducing soil salinity by this method.

(iii) **Selection of tolerant crops and crop rotation:** Tolerance of crops to salts is found to range from sensitive, semi-tolerant, tolerant to highly tolerant, Barley, sugar beet and date-palm are highly tolerant crops which do not suffer from any reduction in crop yield even at a highly salinity. Wheat, sorghum, pearl millet, maize, pulses, sunflower, sugarcane and many vegetables like gourd, brinjal etc, are semi-tolerant. These different crop combinations can be grown on saline soils.

(iv) **Irrigation practices:** Surface irrigation with precise land leveling, smoothening and efficient hydraulic design help to reduce water logging and salinity. High frequency irrigation with controlled amount of water helps to maintain better water availability in the upper root zone. Thin and frequent irrigations have been found to be more useful for better

crop yield when the irrigation water is saline as compared to little heavy irrigation.

(v) Gypsum amendment: Amendment of sodic soils with gypsum is recommended for reducing soil sodicity as calcium of gypsum replaces sodium from the exchangeable sites.

(vi) Green-manures, fertilizers and bio fertilizers: Application of farm yard manure or nitrogen fertilizers has been found to improve saline soils. Green manuring with dhaincha (Sesbania aculeate) sunhemp or guar have also been reported to improve salt-affected soils. Blue green algae have been found to be quite promising as bio fertilizers for improving salt-affected soils.

(vii) Afforestation programmes: The National Commission on Agriculture (NAC) launched several afforestation schemes in the VI th plan to cope up with the problem of spreading wasteland. The National Wasteland Development Board, in the Ministry of Environment and Forests has set a target of bringing 5 million ha of wasteland annually under fire wood and fodder plantation.

(viii) Social Forestry Programmes: These programmes mostly involve strip plantation on road, rail and canal-sides, rehabilitation of degraded forest lands, farm-forestry, waste-land forest development etc.

Role of Information Technology

Information technology has tremendous potential in the field of education and health as in any other field like business, economics, politics or culture. Development of internet facilities, worldwide geographical information system (GIS) and information through satellites has generated a wealth of up-to-date information on various aspects of environment and health. A number of soft-wares have been developed for environment and health studies which are user friendly and can help an early learner in knowing and understanding the subject.

Role of an Engineer in Mitigating Societal Problems:

Information technology has tremendous potential in the field of education and health as in any other field like business, economics, politics or culture. Development of internet facilities, worldwide geographical information system (GIS) and information through satellites has generated a wealth of up-to-date, wares have been developed for environment and health studies which are user friendly and can help an early learner in knowing and understanding the subject.

National Management Information System (NMIS):

Department of science and technology has compiled a database on research and development projects along with information about research scientists and personnel involved.

Remote sensing and Geographical Information System:

Satellite imageries provide us actual information about various physical and biological resources and also to some extent about their state of degradation in a digital form through remote sensing. We are able to gather digital information on environmental aspects like water logging, desertification, deforestation, urban sprawl, river and canal network, mineral and energy reserves and so on.

GIS is a technique of superimposing various thematic maps using digital data on a large number of inter-related or inter-dependent aspects. Different thematic maps containing digital information on a number of aspects like water resources, industrial growth, human settlements, road network, soil type, forest land, crop land or grassland etc. are superimposed in a layered form in computer using softwares. Such information is very useful for future land-use planning. Even interpretations of polluted zones, degraded lands or diseased cropland etc. can be made based on GIS. Planning for location suitable areas for industrial growth is now being done using GIS by preparing **Zoning Atlas.**

Assignment-cum-tutorial questions

(I) Fill in the blanks/statements/matching's/objective questions.

I. Objective type questions
Fill in the blanks / Multiple Choice Questions

1. The concept of sustainable development was given by**……..**
2. The 3-R approach of resource use stands for Reduce, Reuse and **……**
3. The number of organisms sustained by any system on a long term basis is known as it's**……..**
4. Which of the following is not associated with reducing the run-off loss of water **( )**
   (a) Contour cultivation (b) Chemical wetting
   (c) Surface crop residues (d) Fallow soil.
5. Rain water harvesting has the following advantages **( )**
   (a)Avoids flooding of roads (b)Recharges ground water
   (c)Reduce run-off loss (d) All the above
6. Rajendra Singh of Rajasthan was awarded Magsaysay Award for his work on **( )**
   (a) Water conservation (b) Social forestry
   (c) Clean technology (d) Popularization of solar energy
7. Using natural conditions of that region as its components is known as **( )**
   (a) Anthropogenic activities (b) Only nature
   (c) Design with Nature (d) without nature
8. Reducing irrigation losses, conserve water by 30-50% **( )**
   (a) Sprinklers (b) Super slurpler
   (c) Sodium (d) PAN
9. Rehabilitation issues related to **( )**
   (a) Development projects (b) over-exploitation of resources
   (c) Displacement due to mining (d) all the above
10. Rehabilitation issues that effects_____ **( )**
    (a) Kinship systems (b) Increases poverty
    (c) Loss of property (d) all the above
11. Land development and leaching which means **( )**
    (a) Removes water from top layer (b) removes water
    (c) Removes salt from root-zone (d) removes salt from top soil
12. Waste lands are **( )**
    (a) Undulating uplands (b) snow-covered lands
    (c) Both a&b (d) only a
13. Information technology that provides _____data base information **( )**
    (a) Up-to-date (b) delayed information
    (c) Out dated information (d) one day information

Descriptive questions:
Short answer questions:

1. Define climate.
2 What is climate change?
3. Define sustainable development.
4. What is un-sustainable development?
5. Define greenhouse effect.
6. What is global warming?

7. Define acid rain.
8. Write causes of ozone layer depletion.
9. Define rain water harvesting.
10. Write objectives of rain water harvesting.
11. Define water shed.
12. Define water conservation.
13. Define waste land.

Essay type questions:

1. Enumerate sustainable development measurements.
2. Interpret rain water harvesting practices.
3. Analyze watershed management practices.
4. Categorize water conservation practices.
5. Design modern rain water practice.
6. What are the major issues with resettlement and rehabilitation?
7. Explain different waste land reclamation practices?
8. What is the role of an engineer in mitigating societal problems?

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UNIT- V

PATENT LAW, TRADEMARKS AND COPYRIGHTS

Objectives:

- To elucidate the rules and regulations of patents and trademarks.
- To know the laws and protect author's rights.

Syllabus:

Introduction, Types of IPR – Patent requirements - Application process – Ownership – Transfer – Infringement – Litigation. Trade Mark and Copyrights: Introduction – Registration Process – Transfer – Infringement.

Learning outcomes: Students will be able to

- Understand different forms of infringement of Intellectual Property Rights.
- Recognize the relevant criteria for protecting creativity.
- Analyze the likelihood of confusion in Trademark Claims.

LEARNING MATERIAL

INTELLECTUAL PROPERTY RIGHT: Intellectual property, very broadly, means the legal rights which result from intellectual activity in the industrial, scientific, literary and artistic fields.

- Under intellectual property law, owners are granted certain exclusive rights to a variety of intangible assets, such as musical, literary, and artistic works; discoveries and inventions; and words, phrases, symbols, and designs.

- Common types of intellectual property rights include copyright, trademarks, patents, industrial design rights, trade dress, and in some jurisdictions trade secrets.

  Definition of Intellectual Property Right: Knowledge, creative ideas, or expressions of human mind that have commercial value and are protectable under copyright, patent, service mark, trademark, or trade secret laws from imitation, infringement, and dilution. Intellectual property includes brand names, discoveries, formulas, inventions, knowledge, registered designs, software, and works of artistic, literary, or musical nature.

  (OR)

  An idea, a design, a manuscript, an invention, or a concept which will give rise to a useful product or application is known as an "Intellectual Property".

  Types of IPR:

  1.Patents: A patent grants an inventor the right to exclude others from making, using, selling, offering to sell, and importing an invention for a limited period of time, in exchange for the public disclosure of the invention. An invention is a solution to a specific technological problem, which may be a product or a process.

  2.Copyright: A copyright gives the creator of an original work exclusive rights to it, usually for a limited time. Copyright may apply to a wide range of creative, intellectual, or artistic forms, or 'works". Copyright does not cover ideas and information themselves, only the form or manner in which they are expressed.

3.Industrial designs: An industrial design right protects the visual design of objects that are not purely utilitarian. An industrial design consists of the creation of a shape, configuration or composition of pattern or color, or combination of pattern and color in three-dimensional form containing aesthetic value. An industrial design can be a two or three-dimensional pattern used to produce a product, industrial commodity or handicraft.

4.Trademarks: A trademark is recognizable sign, design or expression for products or services of a particular trader from the similar products or services of other traders.
Eg: An example is the word "coca-cola". Here, not only the logo, but also the shape of the bottle, the red imprint too can be considered a trademark, which no other soft-drink manufacturer can copy.

5.Trade dress: Trade dress is a legal term of art that generally refers to characteristics of the visual appearance of a product or its packaging or even the design of a building that signify the source of the product to consumers.

6.Trade secret: A trade secret is a formula, practice, process, design, instrument, pattern, or compilation of information which is not generally known or reasonably ascertainable, by which a business can obtain an economic advantage over competitors or customers.

7.Geographical indications: Geographical indications and appellations of origin are signs used on goods that have a specific geographical origin and possess qualities, a reputation or characteristics that are essentially attribute to that place of origin. Most commonly, a geographical indication includes the name of the place of origin of the goods.
Eg: Darjeeling Tea, Assam Tea, Banarasi Saree, Alphonso Mango, Muga Silk, Channapatna Toys, Pashmina Shawl.

8. Trade name: One area which falls under trademarks is trade names. A company can own several trademarks in their business. However, they usually have one trade name to distinguish themselves from their competitors.

PATENT

- A Patent is a legal instrument for exclusive grant of property rights to the owner or initiator of an invention, to make, use, manufacture, and market the product, provided the invention satisfies certain specified conditions of the law enacted for this purpose as well as other relevant laws of the land related to food, health, safety, security etc.,
- The patent can also be gifted, assigned, inherited, leased or sold to interested buyers. These rights would be available for a limited period of time.

Types of Patents:

1.Utility Patents: Which are granted for those inventions or discoveries that are new and useful for the manufacturing process or new chemical compositions including new materials useful to the general public. This patent is valid for 20 years.

2.Design Patents: Which are granted for new and original ornamental designs or patterns(that is the appearance) for an article of manufacture. This patent is valid for 14 years.

3.Plant patents: Which are granted for those who discover and asexually reproduce a new variety of plant. This patent is valid for 20 years.

Three conditions of Patents: An invention must satisfy the following three conditions:

1.Novelty: An invention will be considered novel if it does not form a part of the global state of the art. Information appearing in magazines, technical journals, books, newspapers etc., constitutes the state of the art.

2.Inventiveness(Non-obviousness): A patent application involves an inventive step if the proposed invention is not obvious to a person skilled in the art i.e, skilled in the subject matter of the patent application.

3.Usefulness: An invention must possess utility for the grant of patent NO valid patent can be granted for an invention devoid of utility.

- **Patent application process in India**:
  - A patent application is a request pending at a patent office for the grant of a patent for the invention described and claimed by that application.
  - An application consists of a description of the invention(the patent specification), together with official forms and correspondence relating to the application.

Documents required for filing an application:

1. Application form in triplicate.
2. Provisional or complete specification in triplicate. If the provisional specification is filed it must be followed by complete specification within 12 months(15 months with extension).
3. Abstract of the invention (in triplicate).
4. Information and undertaking listing the number, filing date and current status of each foreign patent application in duplicate.
5. Priority document (if priority date is claimed).
6. Declaration of inventor ship where provisional specification is followed by complete specification or in case of convention application.
7. Power of attorney(if filed through Patent Agent)
8. Fee in cash/by local cheque / by demand draft.

Patent application process:

The total application process can complete with three stages, which has discussed below-

A. Initial processing:

1. On receipt of an application, the office accords a date and serial number to it. PCT national phase applications and non-PCT applications are identified by separate serial numbers.
2. All applications and other documents are digitized, verified, screened, classified and uploaded to the internal server of the office.
3. Patent applications and other documents are arranged in a file wrapper and the Bibliographic sheet is prepared and pasted on the file cover, so that the files move on for storing in the compactors.
4. The application is screened for:

a) International patent classification
b) Technical field of invention for allocation to an examiner in the respective field.
c) Relevance to defense or atomic energy.

5. Correcting/completing the abstract.
6. Requests for examination are also accorded separate serial number.

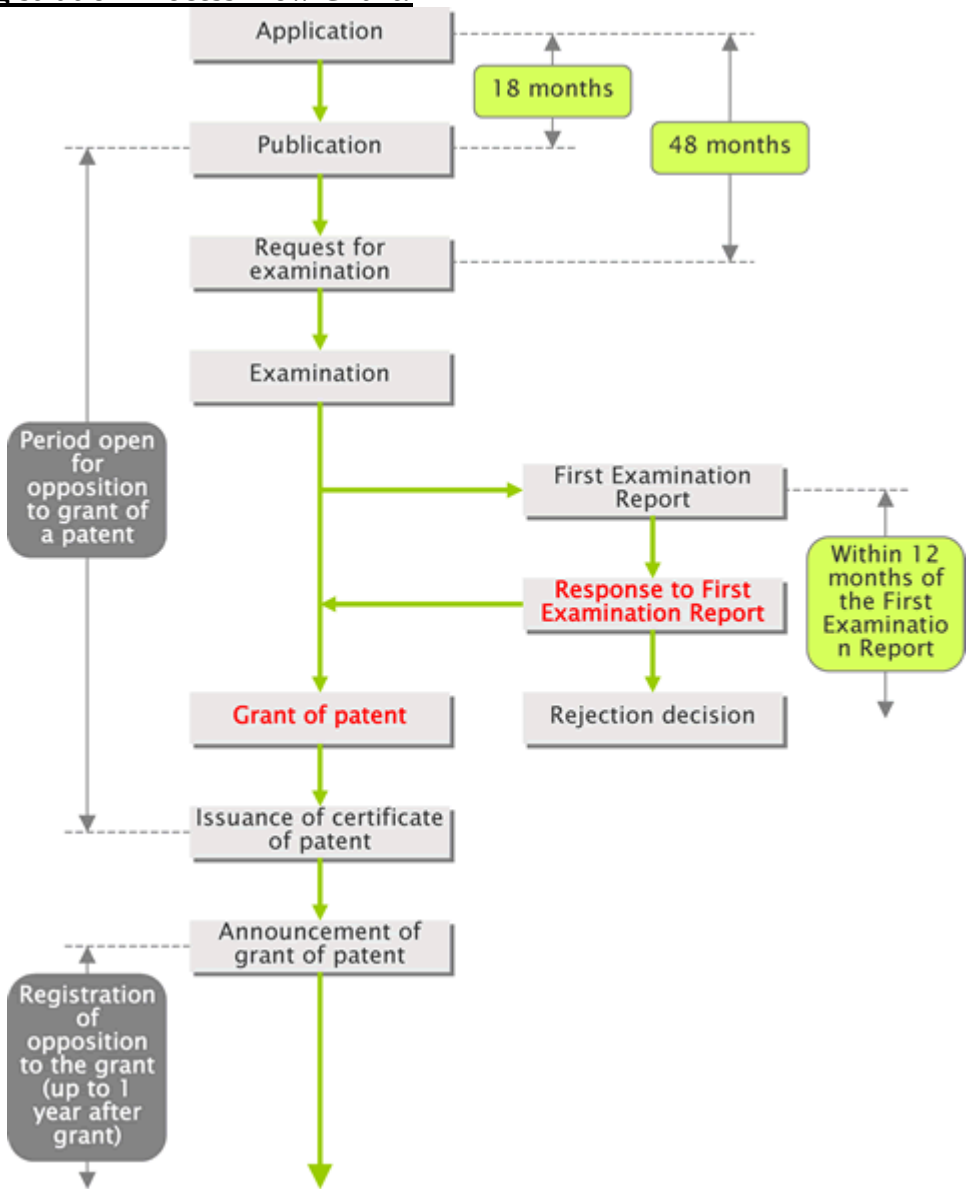
B. Scrutiny of application:

1. The office checks whether the application has been filed in appropriate jurisidiction.
2. The office checks for proof of right to file the application.
3. The office checks whether the application and other documents have been filed in the prescribed format, forms, request, petitions, assignment deeds, translation etc.,
4. The documents are prepared on a proper sized paper, typed in appropriate font with proper spacing.
5. The documents are duly signed.
6. Abstract, drawings (if any) have been filed in proper format.
7. Meaningful claim(s) are present in a complete specification.
8. Power of attorney or attested copy of General Power of Attorney(if any) is filed.
9. Form-5 has been filed (along with complete Provisional or PCT-NP/Convention Application).
10. The invention has been assigned to another person and Form-6 has been duly filed. If the right is assigned from an individual to a legal entity, the legal entity is invited to pay the balance fees.

C. Process of granting a patent right:

1. **Prepare a patent application:**It contains a description of the idea, drawings, a set of legal claims and an abstract that is a brief summary of the idea.
2. **Send your completed application to the patent office:**It can sent to Intellectual Property Office or IPO together with form F1 Request for Grant of Patent which you can get from the Patent Office Guides. There is no charge for filing this application.
3. **The patent office will acknowledge a receipt:** The office acknowledge our form and confirm the filing date of your application.
4. **Fee payment:** Complete form9A send to the patent office within 12 months of your filing date.
5. **Preliminary search:** The Patent Office will examine all your documents and if they are correctly completed they will conduct a preliminary search and send you the results within four months.
6. **Publish your application:** The Patent Office will publish your application within 18 months of your initial application unless you withdraw it.
7. **Substantive examination:** Within six months of publication complete Form 10 and send it to the Patent Office requesting a 'Substantive Examination'.
8. **Certification:** If your idea meets all the requirements for a patent the Patent Office will confirm it and send you a certificate.

Patent Registration Process Flow Chart:



PATENT OWNERSHIP: A patent is a form of personal property that can be assigned, sold, licensed, transferred or left in a will.

Types of patent ownership:

1. **Joint ownership**:
   - When joint inventors produce an invention and it is not part of an employment arrangement, they can detail their respective obligations and ownership of the invention with a joint ownership agreement.
     Eg :- Dave invented the fog-making device with other Effectsco engineers, those other engineers would be named as joint inventors.

2. **University Employees**:
   - Most colleges and universities require that faculty execute formal agreements which grant the university rights to all discoveries made by employees using its labs, equipment, or other resources.

3**. Government Ownership**:

- Government agencies may waive or omit reservation of patent rights when awarding government contracts.

4. **Employee Inventions**:

- Ownership of an employee's invention may depend on the contents of the employment agreement, and also may be affected by a principle governed by state law and known as the shop right rule.
- A shop right rule is the power of an employer to claim the non-exclusive right to use in its business an invention made by an employee.
- A shop right can arise only if the inventor uses the employer's resources to create an invention.

5. **Commissioned Inventions**:

- Some companies may be unable to afford the in-house research and development costs expended by larger companies.
- For this reason, companies often commission consultants or outside contractor to create necessary discoveries or devices.

PATENT TRANSFER: The patentee is authorized to assign, grant license/s or otherwise deal with the patent for a consideration.

Forms of transfer of patent rights:

1. **Assignment**: A patent holder can assign the whole or any part of the patent rights to the whole of India or any part thereof.

Kinds of Assignment:

(a). **Legal Assignment**:

- An assignment of an existing patent through an agreement which has been duly registered is a legal assignment.

(b). **Equitable Assignment**:

- Any document such as letter but not being an agreement, which is duly registered with the controller in which patentee agrees to give another person certain defined right in the patent with immediate effect, is an equitable assignment.

(c). **Mortgage:**

- A mortgage is a document transferring the patent rights either wholly or partly to the mortgagee with a view to secure the payment of a specified sum of money.

2. License: A patentee can transfer a right by way of license agreement permitting a licensee to make, use or exercise the invention.

(a). **Voluntary License**:

- Voluntary license is a written authority granted by the owner of the patent to another person(s) empowering the latter to make, use sell the patented article in the manner and on terms and conditions provided in the license**.**

(b). Statutory License:

- In statutory licensing , the controller and the central government play an important role.

3. Transmission of patent by operation of law:

- When a patentee dies, his interest in the patent passes to his legal representative.

PATENT INFRINGEMENT:

- Patent infringement is the act of making, using, selling or offering to sell a patented invention, or importing into the United States a product covered by a claim of a patent without the permission of the patent owner.

Types of patent infringement:

1. **Literal Infringement:**
   - A literal infringement occurs if a defendant makes, sells or uses the invention exactly as defined in the plaintiff's patent claim.
2. **Doctrine of Equivalents:**
   - If the defendant's invention employs substantially the same means to achieve substantially the same results in substantially the same way as that claimed is known as the doctrine of equivalents.
3. **Improvement Infringement**:
   - A patent can be infringed by means of an improvement.
4. **Design patent infringement**:
   - Infringement of a design patent occurs if the resemblance between the two devices is so similar that a consumer would be deceived.

PATENT LITIGATION:

- When an inventor, business or other entity owns a patent, and that patent is infringed, the patent owner has few alternatives.
- Patent litigation is lengthy and very expensive.

Patent litigation can have several outcomes:

1. Injunctive Relief
2. Exclusion Order
3. Monetary Damages
4. Negotiated settlement
5. Mediation

TRADE MARK

Definition: A trade mark is a word, symbol, phrase, or device which uniquely identifies a particular company, product, or an individual.

Eg:- The word 'coca-cola', here not only the logo, the shape of the bottle, the red imprint too can be considered a trade mark which no other soft drink manufacturer can copy.

Types of Trade Mark:

1. Trade marks
2. Service Marks
3. Certification Marks
4. Collective Marks
5. Multiple Marks

1. Trade Marks:

(i). Word Marks: They consist of letters, words, numbers, or a combination thereof.

Eg:- CNN,NTV, 20/20,Lotus notes, Photoshop, MX-80, UB-40

(ii). Figurative Marks/Logos: Figurative marks are trademarks which consist of a figure or a figure combined with a word.

(iii). Colors: If you want to apply for a certain color for your trademark, you must state that in the application.

Eg:- Fluorescent yellow for tennis balls.

(iv). Characters: Fictional characters such as Mickey Mouse or Mr. Clean may serve as trademarks.
(v).Attach a Reproduction: When you apply for a figurative mark, you need to attach a reproduction of the mark.
(vi). Three-dimensional Trademarks: When the actual product or its packaging has a particular shape, you can protect it as a three-dimensional trademark.
Eg:- Perfume or Liquor bottles.
(vii). Sound Trademark: It is a sound or melody with a distinctive recognition effect.
Eg:- Hem glass ice cream Van jingle.
(viii): Guarantee Trademark: It is registered by authorities, foundations, associations, companies or other societies.
Eg:- International Wool Society's Sign/ wool products.

2. **Service Marks:** Many parties perform services for the benefit of others.
   Eg:- Hilton resort chain performs hotel services for travelers.
3. **Certification Marks:** It is used in connection with products and services to certify regional or other origin, material, and mode of manufacture, quality, accuracy or other characteristics.
   Eg:- IDAHO brand potatoes (geographic origin of the product).
4. **Collective Marks:** It is used by members of a cooperative, an association, or another collective group or organization to indicate membership.
   Eg:- CA device used by the Institute of Chartered Accountants.
5. **Multiple marks:** A manufacturer or provider of services can use any number of trademarks to distinguish it goods or services.
   Eg:- Diet Coke advertisement
   a. Distinctive name- coke
   b. Slogan- Things go better with coke
   c. Red and White wave shapes
   d. Shape of the bottle
   e. Nutra sweet

TRADE MARK REGISTRATION PROCESS:

Documents required for filing a trademark application in India:

1. Trademark or logo copy.
2. Applicant details like name, address and nationality.
3. Goods or services to register.
4. Date of first use of the trademark in India, if used by you prior to applying.
5. Power of attorney to be signed by the applicant in 100 Rs/. Stamp paper.

The procedure for registering trademark in India:

Step 1: Trademark search

- Trademark to be searched.
- Goods/services in respect of which the trademark is to be searched.

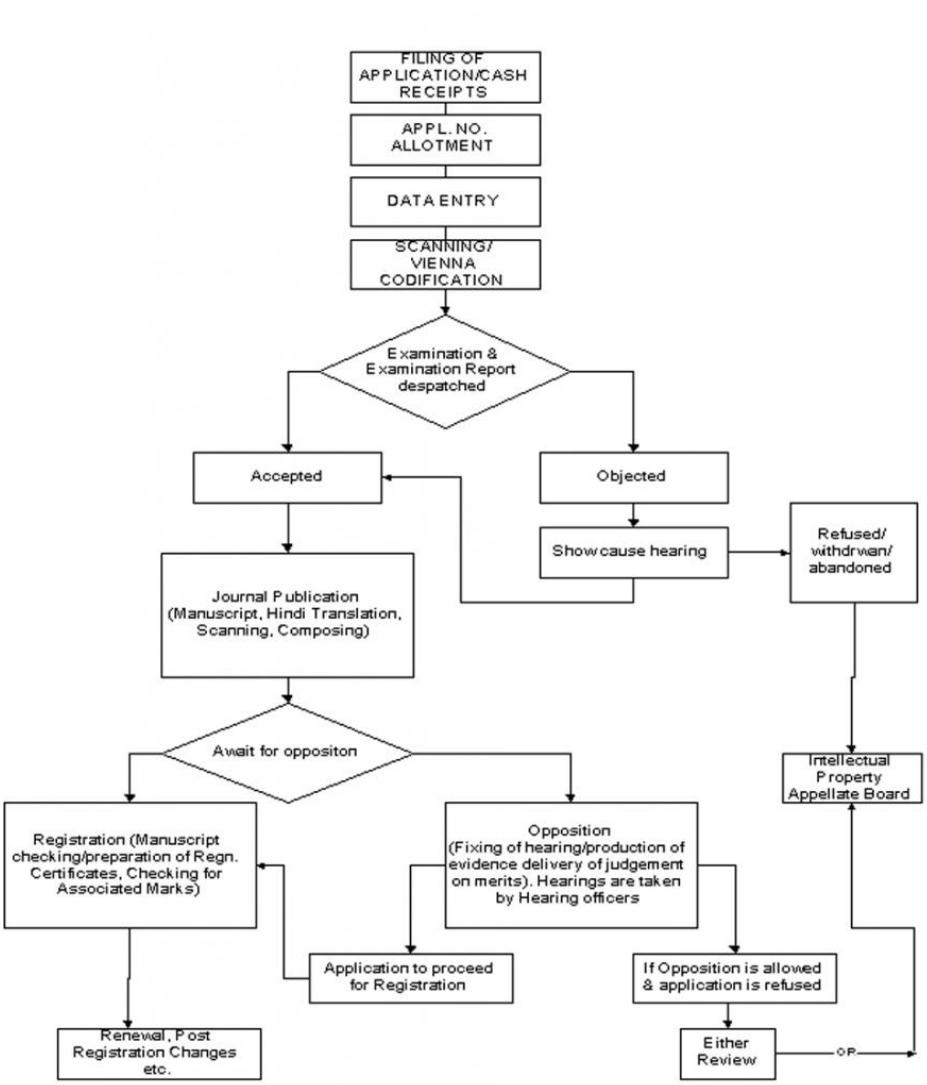
Step2: Create Trademark Application

- Based on the results of the search conducted, the trademark attorney will draft trademark application.
- Upon filing of the application, the registry will issue us with an official receipt with the filing date and number allotted to the application.
- The application is hen formally examined by the Indian Trade Marks Office.

Step3: Trademark Registration

- The trademarks office will first check your application. If it has, a trademark objection will be raised.
- If an objection to registration is raised, an official examination report will issue.
- To overcome the objection, it is necessary to file a written response.
- The Registrar may require the applicant to file an affidavit testifying to such user with exhibits showing the mark as used.
- If , following examination , the trademark application is considered allowable, a Letter of Acceptance will issue, after which the trademark will be published in the Trade Marks Journal.
- If there are no oppositions within four months from the date of advertisement in the Trade Marks Journal, then the trademark registration certificate will issue.
- Once the trademark is registered, it is valid for a period of ten years from the date of application.
- The registration can then be renewed indefinitely as long as the renewal fees are paid.

Trademark Registration Process Flowchart



TRADEMARK TRANSFER:

- Trademarks like any asset can be transferred from one owner to another.
- The transfers could be temporary through licensing or permanent through an assignment.

1. Assignment of a trademark:

- Assignment of a trademark is a process in which the owner of the trademark transfers the ownership of the mark either with or without the goodwill of the business.

(a). Complete assignment:

- The owner transfers all its rights with respect to mark to another entity, including the transfer of the rights such as right to further transfer, to earn royalties.

(b). Partial assignment:

- The transfer of ownership is restricted to specific products or services only.

(c). Assignment with goodwill:

- In this type the rights and value of trademark as associated with the product is also transferred to another entity.

(d). Assignment without goodwill:

In this type the owner of the brand restricts the right of the buyer and doesnot allow him to use such brand for the products being used by the original owner.

2. Trademark Licensing:

- The licensing of a mark is to allow others to use the mark without assigning the ownership.

Trademark Infringement:

- Trademark infringement is the unauthorized use of a trademark or service mark on or in connection with goods and/ or services in a manner that is likely to cause confusion, deception, or mistake about the source of the goods and/ or services.

Eg;-

- The dental cream "COLGATE" is infringed like "COLLEGIATE", which is phonetically similar with deceptively similar letters in white and red background so as to create confusion in the minds of the customers and to pass of its product as COLGATE.

Remedies for Trademark Infringement:

1. Injunctions
2. Damages
3. Impoundment and destruction of infringing articles.

COPYRIGHT

A copyright is a specific and exclusive right for the reproduction of an original work, like films, music, aesthetic material, paintings, multimedia, sound recording, and literary material like poetry and books.

What works are protected?

- Copyrightable works include the following categories:
  - Literary works
  - Musical works
  - Dramatic works
  - Choreographic works
  - Pictorial, graphic, and sculptural works
  - Motion pictures and other Audiovisual Works
  - Sound recordings
  - Architectural works

What is not protected by copyright?

- Titles, Names, Short phrases and Slogans.
- Familiar symbols or designs
- Ideas, Procedures, Methods, systems, processes, concepts, principles, discoveries or devices, as distinguished from a description, explanation or illustration.
- Works consisting entirely of information that is common property and containing no original authorship. Eg:- standard calendars.

REGISTRATION OF COPYRIGHT:

REQUIREMENTS FOR COPYRIGHT REGISTRATION IN INDIA

- Two copies of the work to be protected under copyright registration.
- Name, address and nationality of the applicant.
- Nature of the applicant's interest in the work.
- Title of the work.
- Name, address and nationality of the creator or author of the work and if the author is deceased, the date of his death.
- Year and name of the country of first publication of the work and name, address and nationality of the publisher.
- Year and countries of subsequent publications, if any, and names, address and nationalities of the publishers.
- Names, addresses and nationalities of the owners of the having rights in the copyright work and the extent of rights held by each owner, together with particulars of assignments and licenses, if any.
- Names, addresses and nationalities of other person, if any, authorized to assign or license the rights comprising the copyright.
- No -objection certificate from the Trademark Registry.
- The applications should be signed by the applicant or the advocate in whose favour a Power of Attorney has been executed. The Power of Attorney signed by the party and accepted by the advocate should also be enclosed.

Procedure of Copyright Registration:

Chapter X of the Indian Copyright Act, 1957 and Rule 70 of Copyright Rules, 2013, mention the following procedure about the registration of copyrights in India:

1. **Application**:
    a. An author or applicant can file the application for registration of copyright, himself or via his authorized legal representative.
    b. This application can be made by applying physically in the copyright office or through speed/registered post; or through e-filing facility available on the official website of Copyrights Office (copyright.gov.in).
    c. There should be one application for one work. Each application in Form IV should be accompanied by the requisite fee prescribed in the second schedule to the Rules.
    d. Fee ranges from 500 INR to 40,000 INR, depending on the form of work. The fee can either be in the form of Demand Draft or Indian Postal Order favouring "Registrar of Copyright Payable at New Delhi" or through E-payment.

Other information which needs to be provided is:

a. Name, address, nationality of the applicant;
b. Nature of applicant's interest in the work;
c. Title of the work;

d. Name, address, nationality of the author of the work and if the author is deceased, date of his death;
e. Language of the work;
f. Whether the work is published or unpublished;
g. Year and Country of first publication and Name, address, nationality of the publisher;
h. Year and Countries of subsequent publications, if any, and name, address, nationality of subsequent publishers;
i. Name, address, nationality of person authorized to assign or license the rights comprising the copyright, if any;
j. No-objection Certificate signed by the author (if different from applicant);
k. Vakalatnama or Power of attorney signed by the advocate and the party (if the application is made by the advocate of the party);
l. Three copies of published work must be sent along with the application.
m. If the work is unpublished, two copies of the manuscripts must be sent with the application (one copy will be duly stamped and returned and other will be retained).
n. Application for registration of a computer programme must be filed with the source and object code.
o. Application for registration of an artistic work used or capable of being used in relation to goods must be filed with a statement to that effect and a no-objection certificate from the Registrar of Trademarks.
p. Application for registration of an artistic work capable of being registered as a design must be filed with a statement in the form of an affidavit stating that it has not been registered under Designs Act, 2000 and has not been applied to any article through industrial process.
q. Application must be signed by the applicant or the advocate;
r. Applicant must provide his mobile number and email address to receive the filing number.

2. Examination:

a) Once the application is filed, a diary number is received.
b) There is a provision of a mandatory wait period of 30 days, so that "No Objection" is filed against the claim made by the author.
c) If some objection is filed against the copyright claim, then it may take one more month.
d) The Registrar of Copyrights gives both the parties an opportunity of hearing the matter.
e) After the decision on the ownership or if the objection is rejected, the application goes for scrutiny.
f) The applicant is asked to remove any discrepancy, if found; within 30 days.

3. Registration:

a) On further submission of documents, if the Copyright Registrar, is completely satisfied with the completeness and correctness of the claim made in the application, he shall enter the particulars of the copyright in the register of copyrights and further issue a Certificate of Registration.
b) Registration completes when the applicant is issued with the copy of entries made in the Register of Copyrights.

Term of copyright:

- In the case of original literary, dramatic, musical and artistic works the 60 year period is counted from the year following the death of the author.
- In the case of cinematograph films, sound recordings, photographs the 60 year period is counted from the date of publication.

Transfer of copyright:

1. Transfer by written agreement
2. Assignments and Exclusive Licenses
3. Mortgages and security interests
4. Transfers other than by written agreement
   (i). Transfer upon death
   (ii). Transfer by operation of Law
   (iii)Involuntary transfers
5. Recording transfers of copyright ownership

Copyright Infringement:

- Copyright gives the creator of the work the right to reproduce the work, make copies, translate, adopt, sell or give on hire and communicate the work to public. Any of these activities done without the consent of the author or his assignee is considered infringement of the copyright.
  - Making infringing copies for sale.
  - Permitting any place for the performance of works in public where such performance Constitutes infringement of copyright.
  - Distributing infringing copies for the purpose of trade.
  - Public exhibition of infringing copies by way of trade.
  - Importation of infringing copies into India.

Case1: Rogers vs Koons:

- Photographer Art Rogers shot a photograph of a couple holding a line of puppies in a row and sold it for use in greeting cards.
- The artist Jeff Koons create a set of statues based on the Rogers image.
- Koons was forced to pay a monetary settlement to Rogers.

Remedies for copyright infringement:

1. Injunctive relief
2. Monetary damages.

Punishment:

- Imprisonment for six months with the minimum fine of Rs- 50000
- In the case of second conviction imprisonment for one year and fine of Rs- one lakh.

Assignment-Cum-Tutorial Questions

A. Questions testing the remembering / understanding level of students

I) Objective Questions

1) The term of patent in India----------
2) IPR stands for ---------- ----------
3) GI stands for ----------
4) The word coca-cola is an example for ---------- ---------
5) Darjeeling tea is an example for----------
6) PCT stands for----------
7) What is a patent?
8) What is the term of a registered trademark?
9) What is the term of a copy right?
10) What are IPR?

II) Descriptive Questions

1) What are the three conditions of patents?
2) What are the different types of IPR?
3) What are the legislations covering IPRs in India?
4) Explain about patent transfer.
5) What are the types of patent infringement?
6) Write about types of patents.
7) Explain about types of trademarks.
8) Explain trademark infringement with an example.
9) What is not protected and protected by copyright?
10) Explain copyright infringement with a case study.

B. Question testing the ability of students in applying the concepts.

I) Multiple Choice Questions:

1) If Francesca invents a new process for recording music, she will likely apply for a: [ ]
   a) Patent b) Copyright c) Trademark d) Industrial design
2) The rights of an author or artist with respect to his or her creation are governed by the law of [ ]
   a) Patent b) Copyright c) Trademark d) Industrial design
3) Which is false? Intellectual property rights may be protected by: [ ]
   a) Maintaining secrecy b) Registration
   c) Use of a confidentiality clause d) Assignment
4) Which is not a remedy for infringement of intellectual property rights? [ ]
   a) An accounting for profits b) An injunction
   c) Specific performance d) Damages
5) Use of a trademark that is the property of a competitor is [ ]
   a) The tort of passing off b) The tort of deceit
   c) The tort of fraud d) The tort of negligence
6) IPR protects the use of information and ideas that are of [ ]
   a) Ethical value b) Moral value c) Social value d) Commercial value
7) The following can be patented [ ]
   a) Machine b) Process c) Composition of matter d) All of the above
8) In India, the literary work is protected until [ ]
   a) Lifetime of author b) 25 years after the death of author
   c) 40 years after the death of author d) 60 years after the death of author

9) Symbol of Maharaja of Air India is [ ]

a) Copyright b) Trademark c) Patent d) All of the above

10) Which of the following is not one of the three essential elements for a patent to be granted for an invention? [ ]

a) Be a product b) Be new to the public

c) Involve an inventive step d) Be capable of industrial application

11) Under the Patent Act, the person entitle to receive a patent one new invention is [ ]

a) The one who invented it first b) The one who applied for a patent first

c) The one who commercialized it first d) The one who first thought of it

12) The protection afforded by a Canadian patent lasts for a maximum of [ ]

a) 20 years b) 30 years c) 40 years d) 50 years

C. Questions testing the analyzing / evaluating abilities of the students.

1) If you want to start a company, how do you get a trademark for your company?
2) Mr. Kalyan invents manufacturing process for a product. What is the process of applying for a patent right?
3) If Mr. Sobhan invents a new process for recording music, how does he apply for IPR right?
4) A street vendor on Bloor Street is selling fake 'TAGG' watches. Under which area of intellectual property right, does the 'TAG' company likely seek a remedy?

ENGINEER & SOCIETY

UNIT - VI

ENTREPRENEURSHIP

OBJECTIVES:

- Acquaint the students with challenges of starting new ventures and enable them to investigate, understand and internalize the process of setting up a Business.
- Apply entrepreneurial tools such as business plans, financing, and growth approached to real-life examples.

SYLLABUS:

Meaning, definition& concept of Entrepreneurship, characteristics &skills of entrepreneur, Role of an entrepreneur in economic development.

Learning Outcomes:

Students will be able to

- know the concepts of entrepreneurship, characteristics of entrepreneur.
- impart knowledge on entrepreneurship and its importance in socio-economic development of the nation.
- gain knowledge and skills in different areas.
- explain entrepreneurship development programme, government policies, schemes and incentives for promotion of entrepreneurship and social responsibility of business.

Learning material

INTRODUCTION:

The word **"entrepreneur"** is derived from a French root **'entreprendre'** which means **"to undertake".** The term "entrepreneur" seems to have been introduced into economic theory by **Richard Cantilon** (1755) but **Say** (1803) first accorded the entrepreneur prominence. It was **Schumpeter** however, who really launched the field of entrepreneurship by associating it clearly with innovation.

DEFINITION:

According to **Richard Cantilon** : "An entrepreneur is a person who buys factor services at certain prices with a view to selling its product at uncertain prices." Thus, to Cantilon, an entrepreneur is a bearer of risk which is non- insurable.

WHO IS AN ENTREPRENUER

- He is a person who develops and owns his own enterprise
- He is a moderate risk taker and works under uncertainty for achieving the goal.
- He is innovative
- Reflects strong urge to be independent.
- Persistently tries to do something better.
- Dissatisfied with routine activities.
- Prepared to withstand the hard life.
- Determined but patient
- Exhibits sense of leadership
- Also exhibits sense of competitiveness

- Takes personals responsibility
- Oriented towards the future.
- Tends to persist in the face to adversity
- Convert a situation into opportunity.

THE CHARACTERISTICS OF AN ENTREPRENEUR : -

1. Passion & Motivation

If there's one word that describes *the* fundamental trait in an entrepreneurship, it would be passion.

- Is there something that you can work on over and over again, without getting bored?
- Is there something that keeps you awake because you have not finished it yet?
- Is there something that you have built and want to continue to improve upon, again and again?
- Is there something that you enjoy the most and want to continue doing for the rest of your life?

Demonstration of passion and motivation will determine your success in any entrepreneurial venture. From building and implementing a prototype, to pitching your idea to venture capitalists, success is a function of passion and determination.

2. Risk Taking

Entrepreneurs are risk takers ready to dive deep into a future of uncertainty. But not all risk takers are successful entrepreneurs. What differentiates a successful entrepreneur from the rest in terms of risk? Successful entrepreneurs are will to risk time and money on unknowns, but they also keep resources, plans and bandwidth for dealing with "unknown unknowns" in reserve.

3. Self-belief, Hard work & Disciplined Dedication

Entrepreneurs enjoy what they do. They believe in themselves and are confident and dedicated to their project. Occasionally, they may show stubbornness in their intense focus on and faith in their idea. But the flip side is their demonstrated discipline and dedication.

4. Adaptability & Flexibility

It’s good to be passionate or even stubborn about what you do. But being inflexible about client or market needs will lead to failure. Remember, an entrepreneurial venture is not simply about doing what you believe is good, but also making successful business out of it. Market needs are dynamic: changes are a recurring phenomenon. Successful entrepreneurs welcome all suggestions for optimization or customization that enhances their offering and satisfies client and market needs. A product you develop for yourself alone may qualify as a hobby, but a product for the market should satisfy market needs.

5. Understand Your Offering – And Its Market

Entrepreneurs know their product offering inside and out. They also know the marketplace and its dynamics inside and out. Remaining unaware of changing market needs, competitor

moves and other external factors can bring even great products to failure (for example, Blockbuster).

6. Money Management

It takes time to get to profitability for any entrepreneurial venture. Till then, capital is limited and needs to be utilized wisely. Successful entrepreneurs realize this mandatory money management requirement and plan for present and future financial obligations (with some additional buffer). Even after securing funding or going fully operational, a successful businessman keeps a complete handle on cash flows, as it is the most important aspect of any business.

7. Planning (But not Over-planning)

Entrepreneurship is about building a business from scratch while managing limited resources (including time, money and personal relationships). It is a long-term commitment, and attempting to plan as much as possible at the beginning is a noble impulse. In reality, however, planning for everything and having a ready solution for all possible risks may prevent you from even taking the first step. Successful entrepreneurs do keep some dry powder in reserve, but more importantly they maintain a mindset and temperament to capable of dealing with unforeseen possibilities.

Do a feasibility analysis; identify time and capital thresholds; take the deep dive with your limited resources. If your thresholds are crossed, look for alternatives and be prepared to take the next exit.

8. Networking Abilities

Many people seek comfort in commiseration: friends, colleagues and neighbours are happy to complain with you about "the global slowdown," poor demand, or unfair competition; but that won't improve the bottom line. What do successful entrepreneurs do? They reach out to mentors with more experience and extensive networks to seek valuable advice.

Having such networking abilities, including more experienced mentors, is a key characteristics of successful entrepreneurs.

9. Being Prepared to Take the Exit

Not every attempt will result in success. The failure rate of entrepreneurial ventures is very high. At times, it is absolutely fine to take the “practical” exit route and try something new, instead of continuing to make sunk cost investments in the same venture. Many famous entrepreneurs weren't successful the first time around. But they had the serenity and foresight to know when to cut their losses.

10. Entrepreneurs Doubt Themselves – But Not Too Much

You may ask yourself, am I an entrepreneur? And the very question may put you in doubt about the answer. Even if you don't have the flair of Steve Jobs or the hair of Elon Musk, if you have the courage to ask yourself intimidating questions – Can I do this? Do I *want* to do this? – You have the stuff to be an entrepreneur.

11. Independence:

Most of the entrepreneurs start on their own because they dislike to work for others. They prefer to be their own boss and want to be responsible for their own decisions.

12. Ability to find and explore opportunities:

They exhibit an innovative turn of mind and convert the problems into viable opportunities.

13. Hope of success:

Entrepreneurs set their goals with a hope of success rather than fear of failure.

14. Need to influence others:

Once the entrepreneurs set their goals, they have to play the roles of manager too.

15. Stress takers:

Entrepreneurs are capable of working for long hours and solving different complexities at the same time.

16. Innovators:

Successful entrepreneurs are innovators. They constantly put their efforts in introducing new products, new method of production, opening new markets and reorganizing the enterprise.

17. Business communication skills:

In order to motivate others in the business, entrepreneurs must possess good communication skill. Both written and oral communication skills are necessary for the entrepreneurs for running enterprise efficiently.

18. Business planning:

A successful entrepreneur always follows the principles of management while planning for his business. While planning for setting up a small enterprise, entrepreneurs have to follow the procedures and regulations such as:

(a) Product identification and project selection.
(b) Preparation of techno-economic feasibility report.
(c) Accommodation and other infrastructural facilities.
(d) Power and water connection.
(e) Procurement of machineries and raw materials.
(f) Financial support.
(g) Marketing of the products or services.
(h) Availing incentives and subsidies declared by the Government for development of small scale industry sector.
(i) Procurement of pollution control certificates.

ENTREPRENEURSHIP:

DEFINITION:

- **A.H. Cole** has defined entrpreneurship as "the purposeful activity of an individual or group of associated individuals, undertaken to initiate, maintain, or earn profit by production and distribution of economic goods and services."
- According to **Joseph A. Schempeter** " entrepreneurship is essentially a creative activity".
- According to Peter Drucker "entrepreneurship is neither a science nor an art. It is a practice. It has a knowledge base. Knowledge in entrepreneurship is a means to an end."

CONCEPT:

- It has assumed super importance for accelerating economic growth in developed and developing countries.
- It promotes capital formation and creates wealth in country.
- It is the hope and dreams of millions of individuals around the world.
- It reduces unemployment and poverty and it is a pathway to prosper.
- Entrepreneurship is the process of exploring the opportunities in the market place and arranging resources required to exploit these opportunities for long term gain.
- It is a risk of business enterprise . It may be distinguished as an ability to take risk independently to make utmost.

Entrepreneurship = Entrepreneur + Enterprise

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(Process) (Person) (Object)

CHARACTERISTICS OF ENTREPRENEURSHIP:

Entrepreneurship is a complex and multifaceted subject. The following are the important characteristics of entrepreneurship.

1. Decision making:

Decision making activity is one of the fundamental characteristic features of entrepreneurship. A decision is a course of action which is consciously chosen from among a multiple of alternatives to achieve the desired result.

2. Accepting challenges:

Entrepreneurship means accepting challenges amidst risk and uncertainty. While accepting entrepreneurship as a career, the entrepreneur accepts the challenges of all odds and puts his efforts to convert the odds into viable business opportunities.

3. Risk taking:

One of the important characteristics of entrepreneurship is risk taking or risk bearing. This characteristic feature implies assuming the responsibility for loss that may occur due to unforeseen contingencies of the future.

4. **Building organization:**

   Entrepreneurship presupposes the initiative and skill on building organization. It is by delegation of authorities and proper leadership that organization can be built up.

5. **Skillful management**:

Entrepreneurship involves skilful management. For effective management of an enterprise, the role of an entrepreneur to initiate and supervise design of organization-improvement projects in relation to upcoming opportunities is very much essential.

6. **Innovation:**

Innovation (doing things in a new and better way) is one of the most important characteristics of entrepreneurship**.**

7. **Mobilization of resources:**

Resource mobilization is also a fundamental characteristic feature of entrepreneurship. Entrepreneurs have to mobilize 6M's i.e. Man, Money, Material, Machinery, Market and Method effectively.

ROLE OF AN ENTREPRENEUR IN ECONOMIC DEVELOPMENT

Entrepreneurs are frequently thought of as national assets to be cultivated, motivated and remunerated to the greatest possible extent.
Entrepreneurs can change the way we live and work. If successful, their innovations may improve our standard of living. In short, in addition to creating wealth from their entrepreneurial ventures, they also create jobs and the conditions for a prosperous society.

Entrepreneurs Create New Businesses
Path breaking offerings by entrepreneurs, in the form of new goods & services, result in new employment, which can produce a cascading effect or virtuous circle in the economy. The stimulation of related businesses or sectors that support the new venture add to further economic development.

For example, a few IT companies founded the Indian IT industry in the 1990s as a backend programmers' hub. Soon the industry gathered pace in its own programmers' domain. But more importantly, millions from other sectors benefited from it. Businesses in associated industries, like call center operations, network maintenance companies and hardware providers, flourished. Education and training institutes nurtured a new class of IT workers offering better, high-paying jobs. Infrastructure development organizations and even real estate companies capitalized on this growth as workers migrated to employment hubs seeking new improved lives.

Similarly, future development efforts in underdeveloped countries will require robust logistics support, capital investment from buildings to paper clips and a qualified workforce. From the highly qualified programmer to the construction worker, the entrepreneur enables benefits across a broad spectrum of the economy.

Entrepreneurs Add to National Income

Entrepreneurial ventures literally generate new wealth. Existing businesses may remain confined to the scope of existing markets and may hit the glass ceiling in terms of income. New and improved offerings, products or technologies from entrepreneurs enable new markets to be developed and new wealth created.

Additionally, the cascading effect of increased employment and higher earnings contribute to better national income in form of higher tax revenue and higher government spending. This revenue can be used by the government to invest in other, struggling sectors and human capital.

Although it may make a few existing players redundant, the government can soften the blow by redirecting surplus wealth to retrain workers.

Assignment-cum-tutorial questions

1. Objective type questions:

Fill in the blanks/multiple choice questions

1) The word "entrepreneur" derived from 'Entreprendre' which means_____
2) Entrepreneurship means_____
3) Which of the following is the most important characteristics of a successful business ( )
   a) Hard working b) Training c) Creativity d) Risk taking
4) The term 'Entrepreneur' is introduced in economic theory by _____ ( )
   a) Cantillon b) Sharma c) Ruwe d) Beecher
5) Which of the following shows the process of creating something new? ( )
   a) Business model b) Modelling c) Innovation d) Flexibility
6) Entrepreneur' was distinguished from capital provider in_____ ( )
   a)16th century b) 18th century c) 19th century d) 20th century
7) A person who managed large projects was termed as the 'Entrepreneur' in_____( )
   a) Early period b) Middle age c) 17th century d) 19th century
8) _____ will determine your success in any Entrepreneurial venture ( )
   a) Passion b) Motivation c) Both a&b is correct d) Only a is correct
9) 'Entrepreneurs' create new business with ( )
   a) New goods and services b) New employment
   c) Support new venture d) All the above
10) _____is the key characteristics of successful 'Entrepreneurs' ( )
   a) Networking abilities b) Experienced mentors
   c) Both a&b is correct d) only 'b' is correct

Descriptive questions:

Short answer questions:

1. Define 'Entrepreneurship'?
2. Who is an 'Entrepreneur'.

Essay questions:

1. What do you understand the concept of Entrepreneurship?
2. Explain the evolution of entrepreneurship.
3. Explain the characteristics of an entrepreneur.
4. Explain the role of an entrepreneur in economic development of a nation.
5. What are the skills of an entrepreneur?
6. Explain the skills of an entrepreneur.

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