

Chapter-1

History of Engineering Practices

Man, and Society

Society

- The term 'society' is derived from the Latin word 'socks' which means companionship or friendship.
 - Society is the group of individuals who are related to each other united by certain relation, mode of behavior, geographic territory and cultural expectations.
 - Society reflects the complex interaction among group of people.
 - Every society is unique because it has its own way of life.
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Characteristics of Society

1. Society is composed of a group of people.
2. Society involves relationship between a group of people that binds them together. Such interaction is possible due to mutual awareness.

Social awareness implies reciprocal awareness.

3. The members of the society should possess both likeness and difference among each other. People have likeness with regards to their needs, works, aims, values, and so on. Similarly, they should differ in terms of their ability, potentiality, attitude and so on.
4. The members of the society are dependent to each other to satisfy their needs and aims. Without dependency, the member of the society will have no value.
5. The work done in collaboration is efficient than by the individual. In society, work is performed with co-operation among different members and the task is divided to all based on ability and qualities. This way is efficient as it collects ideas of all and acted upon the best one.
6. Society exhibits changes. So, society is dynamic.

7. Society is the abstract concept as it involves relationships and interactions among the group of people. Society can be realized but not seen.
 8. Society exhibits social control to control the behavior of its members through social norms, traditions, customs, culture and so on.
 9. Every society has its own way of life. Such way is known as culture.
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Theories of Origin of Society

1. Divine origin theory (Made by god)
 2. Social Contract theory (Planned by people for certain goals)
 3. Evolution theory (Result of gradual evolution from unorganized to organized; from less perfect to more perfect)
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Community

- The group of people living together in a certain geographical location sharing the basic condition of life but not the particular interest is called community.
 - Community sentiment is present within a community. It is the sense of feeling of unity.
 - The members of a community must have common interests and common objectives.
 - There should be more likeness within the community.
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Elements of Community

1. A community is a group of people who shares the basic conditions of a common life.
2. All the members of a single community must reside in a definite geographical location.
3. Each community possess community sentiments which is the feeling of belonging together.
4. Community must be stable.
5. Community is formed naturally not according to laws and regulations.
6. Each community has a particular name.
7. There should be likeness in language, custom, religion, culture and so on.

Differences between Society and Community

Society	Community
<ol style="list-style-type: none"> 1. Society is the complex interaction and network of the social relationships. 2. Society do not need a definite geographical area. 3. Feeling of belongingness is not necessary. 4. Society is the bigger group. 5. Society is abstract which cannot be seen. 6. Society involves both likeness and differences. 	<ol style="list-style-type: none"> 1. Community is just the group of individuals sharing the basic conditions of life. 2. Community require a definite geographical area. 3. Community cannot exist without sentiments. 4. Community is smaller than society. 5. Community is concrete which can be located. 6. Community involves more likeness than difference.

Social Change

- Changes are universal. Change should always reflect towards progress.
 - Social change is defined as the modification in the social behavior such as ways of acting and thinking of members of the society which reflects more and more positivity towards culture, social structure and behavior over time.
 - Social change is the progressive transformation of the society.
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Factors Affecting Social Change

1. Social change is affected by change in culture. Culture is just a system adopted by the people which changes due to invention, discovery and diffusion. Such cultural changes add some prospects to the society leading to social changes.
 2. Demographic changes mean the change in society and its members due to high birth rate, low death rate and migration factors.
 3. Ideas and opinions of people changes over time. With evolution of new ideas and the modification of old ideas, there is great impact on social change.
 4. Social conflict and social division based on class, religion, gender, caste and so on also causes social changes.
 5. Social movements are the organized efforts of a group of people about changes in values, norms, culture and traditions of the society. It brings about progressive social changes.
 6. Environment is never constant. Environmental changes occur over time because of various factors like climate, natural calamities and so on. It directly affects the social life and brings social changes.
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Theories of Social Change

1. Socio-Cultural Evolution Theory

- It is based on the assumption that society gradually develop from simple beginnings into more complex forms.
- Social changes occur due to the necessity of new and higher level of civilization for progress and betterment.

2. Functionalist Theory

- It is based on the assumption that society consists of interdependent parts, which tends to maintain stability.
- Social changes are the result of imbalance in internal or external system and necessary adjustments to bring back the equilibrium state.

3. Class Conflict Theory

- It is based on the assumption that the society consists of people of different classes, and conflicts between these classes is inevitable over time.
- Such class conflict results in dissolution of current society and results in new societies leading to social change.

4. Cyclical Theory

- It is based on the assumption that each civilization is like a biological life cycle of an organism, which has birth, maturity, old age and finally death.
- The society faces challenges from environment, internal and external factors which determines the fate of the society.
- If the society cope with the challenges, it moves towards progress; otherwise it dies.

Role of Engineers in Development Activities

1. Creating vision
 2. Preparing mission
 3. Execution of the plan
 4. Monitor and Evaluate
 5. Train
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Technology and Society

Technology

- Technology is defined as the proper knowledge and use of the tools and techniques that facilitates transfer of inputs into outputs in an efficient manner.
 - Technology is generally evolved for accomplishment of certain objectives.
 - Technological change is defined as the modification and alteration of the current tools and techniques so as to bring improvement in the society and thus improve productivity.
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Technology and Social Change

- Technology and social change are connected to each other.
 - Change in technology has great impact in the society.
 - Technological change affects all the social entities and forces changes in values, norms and attitudes.
 - It brings impact in the society.
 - With the advancement in society, new social conceptions and movements arises so as to improve the condition of life. - All these factors lead to the social changes.
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Impacts of Computer on Society

1. Impact on problem solution

- Computers are used to solve various complex problems very efficiently and in short time, which would be impossible to solve for humans.
- With the use of computers, today the world has felt the power in it which was thought to be impossible in past.
- Such development includes medical diagnosis, quality control, and so on.

2. Impact on employment and production

- With use of computer, productivity increases as it is able to perform the task in very short period of time.
- But the problem is that it is overtaking the job of people creating a lot of employment problems.

3. Impact on Individual

- Due to the use of computers, the world has become a global village.
- The interaction among people become virtual just with the help of online systems like Facebook. - It reduces in the human relationships.

4. Impact on Life Quality

- It provides the better quality of services at low costs and effort. This improves the quality of life.
 - It helps to focus on only the necessary works eliminating loss of time considering for the unnecessary tasks.
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Computer Crime

- Computer crime is defined as the use of computers to perform criminal activities.
- The various computer crimes are shown below:
 1. Unauthorized use, access and modification of hardware and data.
 2. Unauthorized access of information and revealing the sensitive data to others.
 3. Illegal use of copyright materials.
 4. Destruction of others resource with the help of computer viruses.
- Cyber law is defined as the law that is established and enforced so as to maintain the proper use of computers and minimize the cybercrime.

Chapter-2

Profession and Ethics

Profession

- Profession is the vocation (feeling for particular occupation) founded on the systematic knowledge acquired through specialized educational training.
 - Profession is those occupation that needs special skill and training. - Profession delivers services to the society that helps to achieve progressive social change.
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Characteristics or Features of a Profession

1. A profession must need strong theoretical knowledge and skills to apply those knowledges in practice.
 2. Profession have professional bodies which includes professionals and are intended to enhance status of their members and require some qualification for being member of that body.
 3. Profession must have sense of together associated with the professionals of same profession.
 4. Profession should register a membership for authentication of knowledge and skills for professionals.
 5. Profession require extensive education period of at least 3 years in University.
 6. Each profession has its own code of conduct and code of ethics to be followed.
 7. Profession should focus on public service rather than self-interest.
 8. Profession should exclude those who have not meet the qualification requirements.
 9. Profession achieve high status and rewards from the public.
 10. Profession should have clear legal authority over the activities that it performs.
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Engineering Profession

- Engineering profession is the occupation that is performed by the professional and licensed engineers for the positive progress in technology and society.
 - The features of the engineering profession are as follows:
 1. Theoretical knowledge
 2. Long training period
 3. Relevant to social values
 4. Service oriented
 5. Complete autonomy
 6. High sense of community
 7. Long term commitment
 8. Highly developed code of ethics
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Professional Institutions

- Professional institution is an independent body that regulates the practice of professional engineering and governs its members in accordance with the rules of the body and act of the country so as to serve the public interest.
 - It is the organization that represents the interest of the professional practitioner.
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Objectives of Professional Institutions

1. Center of learning through professional interest network
 2. Provide professional status and responsibility
 3. Voice of profession
 4. Facilitates the best practices
 5. Maintain and develop standards of knowledge and skills
 6. Maintain standards of qualification and practice
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Role of Engineer with Client, Contractor and Fellow Engineers

Relation with Client

1. The engineer should be faithful to client.
 2. The engineer should not accept compensation from more than one party for same service.
 3. The engineer should undertake only the job he/she is qualified for.
 4. The engineer should not disclose any information about client and technical processes.
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Relation with Contractor

1. The engineer should be faithful to the employer.
 2. The engineer should perform qualified task provided by the employer on time and with quality.
 3. The engineer should indicate the employer the adverse consequences if his/her judgement is overruled.
 4. The engineer should not divulge any confidential findings of actions of the board in which he/she is involved in.
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Relation with Fellow Engineers

1. The engineer should not take credit for the works performed by others.
2. The engineer should endeavor opportunity for professional development and advancement of fellow engineers.
3. The engineer should not injure the professional reputation and prospects of other engineers.
4. If the engineer has proof that fellow engineer is being unethical, he/she should advise to proper authority.
5. The engineer should not review the work of other engineers for the same client unless authorized.

6. The engineer should cooperate with fellow engineers for sharing information and experience to advance the engineering profession.
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Ethics, Code of Ethics and Engineering Ethics

Ethics

- Ethics is a moral principle that governs the behavior of a person and the way of conducting an activity.
 - It involves systematizing, defending and recommending concepts of right and wrong behavior.
 - Professional ethics refers to the ethical obligation that the professional in his/her profession have to follow for their professional status.
 - It indicates how the professionals ought to behave in their professional work.
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Moral

- Moral is the standard behavior accepted by the culture and religion of the society.
 - It is concerned with the human behavior and the established social norms.
 - Non-moral refers to deviation from the moral quality of the society.
 - The factors affecting the moral of a profession are as follows:
 1. Salary
 2. Defective norms and social values
 3. Law moral of self-4. Law implementation
 5. Political commitment
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Code of Ethics

- Code of ethics is the guidelines for professionals which is developed by the professional associations which governs the conducts of all the members of that association.
 - It ensures that the professional practice is for social progress rather than personal gain.
 - The professionals must follow the code of ethics to remain registered.
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Reasons for Unethical Acts

1. Lack of awareness about the code of ethics
 2. Insensitivity to issues
 3. Selfishness
 4. Faulty reasoning
 5. Pressure
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Engineering Professional Ethics

- Engineering professional ethics is the field of applied ethics that examines and set standards for engineers' obligations to the public, their clients, employer and the profession.

The fundamental code of ethics for engineer are as follows:

1. Protection of life and safe guarding the people.
2. Sustainable management and care of the environment
3. Community wellbeing
4. Professionalism, integrity and competence
5. Sustaining engineering knowledge

The professional code of conduct for engineers are as follows:

1. Discipline and honesty
2. Politeness and confidentiality
3. Non-discrimination

4. Professional work
5. No any improper activities for financial gain
6. Personal responsibility
7. Contract (name, designation and registration no)
8. No publicity that cause adverse effect

Moral Dilemma and Ethical Decision Making

Moral Dilemma

- Moral dilemma is the condition in which one must have to choose one of the two equally unpleasant things to perform.
- The feature of moral dilemma is that the agent should perform one of the actions among two actions but not both actions and no matter what action is performed will be wrong in some way. - In such cases, there is no clear right or wrong path.

Ethical Decision Making

- Ethical decision making is the process that helps people to make proper decision during ethical dilemma.
- It examines three perspectives:
 1. ethic of obedience
 2. ethic of care
 3. ethic of reason
- To make a good ethical decision, one need a trained sensitivity to ethical issues and a practiced method for exploring the ethical aspects of a decision.
- The priority that must be considered while making ethical decision are as follows:
 1. Society
 2. Profession
 3. Organization
 4. Individual

Framework for Ethical Decision Making

1. Recognize an ethical issue
 2. Get the facts
 3. Evaluate alternative actions
 4. Make a decision and test it
 5. Act and reflect on the outcome
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Duties of an Engineer and Architect

The major duties of an engineer and architect are as follows:

1. Planning, surveying, designing and estimating the project.
 2. Supervise and control the work.
 3. Constantly participate in the ongoing projects.
 4. Supervise and coordinate the subordinates.
 5. Take responsibility for safety precautions at the job site.
 6. Have the authority to issue variation order.
 7. Have the right to stop the work.
 8. Familiar with work practices and customs.
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Negligence, Tort and Liability

Negligence

- Negligence is the lack of proper care or attention.
- It involves actions of the people which is against the standards.
- To be the compensated from the guilty of negligence, following elements should be established:
 1. The defendant had a legal obligation to behave in certain way.
 2. The defendant failed to fulfill this obligation by acting inappropriately.

3. The injury or loss was caused due to the defendant's legal breach of contract resulting damage.

Tort

- Tort is defined as the damage, injury or wrongful act done willfully, negligently or in circumstances involving strict liability without breach of contract.
 - It involves the situation in which a person's behavior caused suffering to others.
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Liability

- Liability is defined as being obligated to pay for damages or loss. - It is the obligation to pay penalty for not fulfilling the defined duties, negligence and tort.
 - Liability is of following types:
 1. Liability under contract
 2. Liability in tort
 3. Liability under statute
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Vicarious Liability

- Vicarious liability is the liability hold by one party for the actions of another.
- For egg: consider that a tort is committed by an employee in the course of his employment, then the employee is liable for the tort along with the employer is also liable for the tort committed by his/her employee. Such liability accounted for the employer is called vicarious liability.

Chapter-3

Professional Practices in Nepal

Public Sector Practice

- Public sector are the organizations that are run by the budget allocated by the government.
 - The public sector includes state organizations, authority like Nepal Telecom, Nepal Electricity Authority, etc. and universities like IOE, TU, etc.
 - To be recruited as an engineer in public sector, one must be involved in the examination taken by Public Service Commission (PSC) under Government of Nepal, Civil Service.
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Job Description for Fresh Graduates in Public Sector

1. Perform preliminary feasibility study, design, implementation and evaluation
 2. Execute and assign for project works
 3. Conduct programs for increasing public capacity
 4. Report writing
 5. Monitor and evaluate ongoing projects
 6. Execute and perform works as assigned by the immediate superiors
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Private Sector Practice

- Private sector are the organizations that are operational for business purposes operated through the general people.
 - It includes construction companies, private engineering colleges, software companies, industries and so on.
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Job Description for Fresh Graduates in Private Sector

1. Coordinate works between stakeholders, client and contractor
2. Supervise, monitor and control works
3. Design and Quality control
4. Production, operation and maintenance
5. Plan project and report progress
6. Prepare technical report
7. Conduct necessary trainings

Chapter-4 Sector

Contract Management

Methods of work execution

National Competitive Bidding

- All the eligible bidders are invited to participate in bidding.
 - Tender noticed is published in national newspaper giving a period of at least 30 days.
 - It is necessary if the estimated amount of work is greater than 20 lakhs or estimated goods is greater than 10 lakhs.
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International Competitive Bidding

- Eligible bidders from all over the world are invited if the amount of work cannot be performed by domestic contractors.
 - Tender notice should be published in national newspaper giving at least a period of 45 days.
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Sealed Quotation

- According to Public Procurement act, the goods and other services valuing up to 1 million rupees and construction work valuing up to 2 million rupees may be procured by inviting a sealed quotation. - Sealed quotation means the statement, accompanied by the quoted price, in a sealed envelope, submitted by an interested person, firm or organization in respect of provision of any goods or other services in response to a notice of a public entity.
- The provision related to sealed quotation are as follows:
 1. Before inviting a sealed quotation, a form stating every specification clearly shall have to be prepared.
 2. A notice shall be published in national or local newspaper giving at least a period of 15 days.

3. The sealed quotation, once submitted, cannot be withdrawn or amended.
 4. The sealed quotation with the lowest cost estimate shall have to be approved.
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Direct Procurement

- Capital goods valuing up to 3 lakhs and construction work valuing up to 5 lakhs rupees may be directly procured.
 - Direct procurement involves procuring the necessary services from the supplier directly without any bidding or sealed quotation process.
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Contract

- Contract is an agreement between two or more than two persons to do or not to do something, which can be enforceable by law.
 - Contract Act is formulated in 2056 BS.
 - After entering a contract, if any party breaches the contract, legal action can be taken as per the contract act 2056.
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Elements of a Contract

1. Offer and Acceptance:
 - Contract exists whenever a person advances a proposal to a person, who accepts it.
 - Offer can be specific or general.
 - Contract does not exist if no acceptance is received within the specified period of time.
 - The person who offers a proposal cannot bind the person with the statement that if the notice of rejection is not given then he shall be deemed to accept the offer.

- No contract exists if the offeror dies or become insane before the proposal is accepted.

2. Consideration:

- It includes the cause, motive or impelling influence that induces a contracting party to enter into contract.
- It is defined as something with value that is exchanged by the contracting parties.

3. Capacity to Contract:

- For a contract to be legal and valid, all the parties entering into contract must be capable.
- According to contract act, idiots, drunkards, insane and children below 16 years are not capable of signing a contract.

4. Lawful Purpose:

- The contract is invalid if the two parties agree to perform a job against the law of country.

5. Possibility of Performance:

- If two parties agree up on impossible jobs, the contract is invalid.

6. Free Consent:

- Contract should not involve fraud, undue influence and deceit.

7. Certainty:

- The contract that cannot be carried out because of various reasons are not valid.

8. Legal Relationship:

- There should be a clear intention of parties to enter into a contract with all the necessary documents.

9. Written:

- Verbal agreement cannot be considered as a contract. - Contract should be written agreement.

10. Two or More Competent Parties:

- Contract is made between two or more parties.
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Types of Contract

1. Valid Contract:

- If all the elements of contract are present, it is said to be a valid contract.

2. Voidable Contract:

- The contracts that will not be valid if the concerned party desire to make it void are called voidable contracts.
- The following contracts are voidable: a) Forceful contract
b) Contract due to undue influence
c) Contract involving fraud or misstatement.

3. Void Contract:

- A contract that is not considered as a valid contract is known as void or null contract.
- The following contract are void: a) Contrary to statutory law
b) Impossible job performance
c) Contrary to public policy and welfare
d) Signed by incompetent parties

Importance of Contract

1. It makes legal agreement between the parties.
 2. It specifies what the contractor must do and what the owner must pay.
 3. It specifies what will be done if any party fails to perform.
 4. It defines what is and what is not included in a contract.
 5. It specifies how the contract will be terminated.
 6. It states the responsibilities of all the parties involved.
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Tender (Bid)

- Tender is an offer in written by the person who offers the tender to execute some specified work or to supply some specified goods at a certain rate within fixed time frame under certain conduction of agreement.
 - It is the first step in formulation of contract.
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Necessity of Tender

1. Tender is performed to select the best contractor.
 2. It helps to achieve quality output.
 3. It helps in gaining work at competitive price.
 4. It maintains transparency.
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Tendering Process

1. Determine tender process:
 - The organization requesting the tender determines the type of tender to be used.
 - It may be open tender, select tender, multi stage tender or invited tender.
2. Prepare request for tender:
 - The request for tender is prepared which must include what is required, the contractual requirements and how the contractors should respond.
 - It is the invitations for the suppliers to provide a competitive offer to win a contract.
 - It may be RFT, RFP, EOI, CFB or ITT.
3. Invite tender:
 - The invitations are sent to the contractors.
4. Suppliers respond:
 - The supplier should collect all the required documents.

- The supplier then submits the response in the right format on time and at the right location.

5. Evaluation and selection:

- Each tender will be checked for compliance.
- The tender will then be evaluated against the criteria specified in the tender documentation.
- The tender that offers the best value of money will be selected.

6. Notification and Debriefing:

- The successful contractor will be notified and advised to write the outcome.
- The unsuccessful tenderers are also advised and offered a debriefing interview.

7. Contract Establishment:

- A formal agreement between the successful contractor and the relevant agency is established.

Tender Notice

- Tender notice is the information inviting bids from competent contractors.
- It should be published in national newspapers.
- It should include all the necessary detail information about the project.

Information in Tender Notice

1. Name and address of the public entity inviting bid.
2. Nature of work and its location.
3. Place of delivery of goods to be supplied, the services to be delivered and the construction work to be performed.
4. The amount of bid security and validity period of the bid.
5. Data, time and place where and when the tender document is available.

6. Cost of tender document.
 7. The place, manner, deadline for the submission of the bidding documents.
 8. Provision of e-bidding and its process
 9. The place, date and time for the opening of bids
 10. Expected date of acceptance of successful bids
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Bidding Document

- Bidding document is a document prepared by the concerned firm making invitation to bid for submission by bidders by filling up the price or rate.
 - It includes instructions for bidders, specifications, evaluation criteria, conditions of contract and other similar documents.
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Earnest Money

- Earnest money is the amount of money deposited while bidding a tender as a guarantee of a party's interest in performing the work awarded to him/her.
 - Bidder shall have to submit the bid along with bid security of 2 to 3 % of the estimated amount of the bid in cash or equivalent bid security issued by a commercial bank.
 - Earnest money is refunded to the unsuccessful bidders.
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Performance Security

- Performance security is the amount of money deposited by a successful bidder as a security for satisfactory performance. - Successful bidder should submit 5 % of the contract amount as performance security.
- It is refunded after defect liability period.
- It is forfeited if the contractor fails to perform his/her duty.

Pre-Qualification

- Pre-qualification is the process in which assessment is done by the implementing agency to check the suitability of the firms to carry out a particular contract before inviting for a bid.
- It is the process of short listing of eligible bidder that ensures that the invitation to bids are provided to only perspective bidders with adequate capability and resources to perform the contract. - It includes assessment with respect to experience, past performance, capabilities, financial position and litigation (process of taking legal action) history.

Chapter-5

Regulatory Environment

Nepal Engineering Council Act

- Nepal Engineering Council is an autonomous body formed under NEC Act 2055 BS with the mission of regulating engineering profession effectively and scientifically and also undertaking licensing of Engineers in accordance with their qualification.

Objectives of NEC

1. To prepare policies, plans and programs for the smooth functioning of the engineering profession.
 2. To set norms and standards for engineering education in Nepal.
 3. To grant permission and approval to carry out engineering education to those engineering colleges that meet the required norms and standards.
 4. To monitor and inspect the quality of engineering education provided by the engineering colleges.
 5. To register the name of qualified engineers in the council and provide them the license.
 6. To remove the name of registered engineers from the registration if found to violate the code of ethics.
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Scope of NEC

1. Licensing of Engineers
 2. Accreditation of certificates of academic qualification
 3. Recognition of the academic institutions
 4. Professional code of conduct
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Engineer Licensing Process

- Registration of engineers is done into one of the three categories:
 1. General Engineers - Category A: (Requires Bachelor's Degree in Engineering)
 2. Professional Engineers - Category B: (Requires Master Degree in approved Engineering field)
 3. Foreign Engineers - Category C: (Non-Nepali engineers willing to work in Nepal, Bachelor's Degree in Engineering and minimum 10 years of experience in engineering field.)
- An application should be submitted to Nepal Engineering Council with applicable fees along with the following documents:
 1. Attested copies of Academic Certificates
 2. SLC mark sheet
 3. Character certificate of SLC
 4. Intermediate level or 10+2 Transcript
 5. Character certificate of Intermediate level or 10 +2
 6. B.E. Provisional Certificate
 7. B.E. Transcript
 8. Character certificate of B.E.
 9. Attested copy of Citizenship

NEA vs NEC

1. NEA is an independent non-profit organization registered under Social service act of Government of Nepal. NEC is an autonomous body formed under Nepal Engineering Council Act.
 2. NEA focuses on safeguarding of rights and interests of the engineers and thus promoting development of science and technology. NEC focuses on code of ethics that must be followed by the engineering professionals.
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Labor Law

-Labor law is the law concerned over the rights, interests, facilities and safety of workers and employees working in the enterprises of various sector.

- The engineer is responsible to understand the welfare activities that influence the workers to work with efficiency and interest. - Labor act is formulated in 2048 BS.

Article related to Working Hours

1. For a labor, maximum working hour is 8 hours a day or 48 hours a week, with one day leave in a week.
2. A labor shall not be forced to work continuously for more than 5 hours. 30 minutes break shall be provided for tiffin and rest.
3. A labor shall be paid overtime by 50% of the wage if working for more than 8 hours a day. Overtime shall not be forced and exceed 4 hours a day and 20 hours a week.

Article related to Provision of Welfare

1. Welfare fund
 2. Compensation
 3. Gratuity, provident fund and medical service
 4. Leave
 5. Provision of quarters
 6. Provision for children
 7. Rest room
 8. Cafeteria
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Arrangements related to Health and Safety

1. Maintaining the establishment in a neat and clean condition
 2. Adequate ventilation, light and suitable temperature in working rooms
 3. Disposal and destruction of refuse, dirt and filth
 4. Prevention from dust, polluted air, fumes or other contaminated matter
 5. Necessary personal protective equipment to avoid any adverse effect on health
 6. No overcrowding of any working room
 7. Adequate hygienic water for drinking during the period of work
 8. Separate modern toilets for male and female workers in easily accessible places
 9. Compulsory medical checkups of workers at least once every year
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Intellectual Property Right

- Intellectual property right is the rights related to patents, design, trademarks and copyright.
 - Intellectual property refers to a number of distinct types of creations of the mind for which property rights are recognized.
 - The owners of the intellectual property are granted certain exclusive rights.
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Trademark

- Trademark is defined as a mark that is used by a person for the purpose of distinguishing goods or services manufactured produced by any firm or individuals.
- Nobody shall use or copy any trademark in a way if manipulating the people in general without a written consent of person in whose name the trademark is registered.

- The ownership of a trademark can be transferred to other with a permission of the department.
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Design Right

- Anybody may have a right on design of any goods under the act, which is made by him and has been registered in the department.
 - Ownership of the design can be transferred.
 - Nobody shall make any goods by using other's design without written consent of the person in whose name the design is registered.
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Patent

- Patent is defined as any useful invention invented through a new method.
 - Patent right refers to the rights granted to anyone who invents or discovers any new and useful invention.
 - A patent application must include one or more claims defining the invention that is new, non-obvious and useful.
 - It prevents others from making, using, selling or distributing the patented invention without permission.
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Copyright

- Copyright is defined as the sole right to produce or reproduce the work or any substantial part in any material form whatever. - Any person registering any of his work shall have the copyright in accordance with the provisions of the act. - The copyright ownership can be transferred.
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Building Codes and Bylaws

- Building bylaws are the set of guidelines regarding the design of buildings, orderly and systematic planning of the area and ensure safety standards.
 - It is the crucial tool used by the engineer to control improper growth and development of the cities.
 - Building codes and bylaws provides the regulations and standards to be met while designing, constructing or remodeling the buildings. - Building codes are the set of rules specifying the minimum acceptable level of safety for constructed objects.
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Objectives of Building bylaws

1. To design and construct the buildings as per the environmental aspects and standards.
 2. To develop necessary physical infrastructure in efficient manner.
 3. To ensure safety of the public on building construction.
 4. To create comfortable living standard.
 5. To conserve cultural and historical values.
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Company Registration

Company

- A company is an association where the members share a common purpose and are united to use their skills to achieve specific goals.

Characteristics of a company

1. Legal entity
2. Perpetual existence
3. Limited liability
4. Common seal
5. Capital collected by distributing shares
6. Transferability of shares

7. Transparency

Types of Business Enterprise

1. Sole business:

- A sole business is the business organization which has a single individual as a proprietary.
- A single person is responsible to establish, manage, organize and control the whole business.
- A single person is liable to both profit and loss.
- It is easy to form and dissolve.

2. Partnership business:

- A partnership business is the business organization which involves more than one people collectively make effort to establish, manage, organize and control the business processes.
- It involves joint ownership of two or more people. - All the partners share profit and loss.

3. Company business:

- A company is established under the act of the country and has limited liability.
 - Finance is collected through issuance of share.
 - It is divided into: private limited company and public limited company.
 - A limited company is a company in which the liability of members of the company are limited to what they have invested or guaranteed to the company.
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Difference between private limited company and public limited company

Private Limited Company	Public Limited Company
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<ol style="list-style-type: none"> 1. It should have minimum of 2 members and maximum of 50 members. 2. It cannot subscribe its shares to the public. 3. Shares cannot be transferred. 4. It has no provision to collect minimum subscription. 5. The company name should contain pt. ltd. at last. 6. There are two directors in the board of directors. 7. The scope is limited to the known people and places nearby. 8. It is financially weak. 9. It does not have its own Articles of Associations. 10. Many documents are not disclosed to the shareholders. 	<ol style="list-style-type: none"> 1. It should have minimum of 7 members. 2. It can subscribe its shares to the public. 3. Shares are transferrable. 4. It cannot sell shares in the share market until minimum subscriptions is collected. 5. The company name should contain ltd. at last. 6. There are at least three directors in the board of directors. 7. The scope is wide and expanding. 8. It is financially strong. 9. It must have its own Article of Associations. 10. Many documents and information should be submitted to the registrar of Company and to the shareholders. 11. It observes a lot of legal formalities.
Private Limited Company	Public Limited Company
<ol style="list-style-type: none"> 11. It observes a smaller number of legal formalities. 	

Company Registration Process

- An application in the specified format for registering a company should be provided to the Registrar of Company, including all of the following documents and applicable registration fee: 1.

Memorandum of association of proposed company

2. Articles of association of proposed company

3. Copy of the agreement such as joint venture agreement if any 4.

Copies of citizenship certificates of the founder stakeholders.

Chapter-6

Contemporary Issues in Environment

Globalization and Cross-Cultural Issues

Globalization

- Globalization refers to the free movement of goods, services, capital and information across the national boundaries. - It helps in extending social relations across the world. - It is caused due to advancement in transportation and communication.
 - It is an ongoing process by which regional economics, societies and culture are integrated through a global network of communication and trade.
-

Benefits of Globalization

1. Increase in innovation
 2. Rich cultural exchange
 3. Improved living standards
 4. High average income
 5. Global market
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Effects of Globalization

1. Permanent economic shift
 2. Increasing homogeneity
 3. Job insecurity in developed countries
 4. Fluctuation in price due to competitive market
 5. Cultural degradation due to influence of modern culture
-

Cross Culture

- Culture refers to the ideas, customs and social behavior of the particular people or society.
 - Cross culture is defined as the initiative to increase understanding of different group or society so as to develop effective communication and marketing efforts to reach out customers outside its traditional market.
 - It refers to the forms of interaction between members of different cultural groups.
 - The successful international trade depends upon the smooth interaction of employees from different cultures and regions. So, positive cross-cultural experience is very important.
 - Cross cultural competence helps the individuals to adapt effectively in cross cultural environments.
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Public Private Partnership (PPP)

- Public private partnership is the government service or private business that is operated and funded through a partnership of government and one or more private sector companies.
 - It involves a contract between a public sector authority and a private party.
 - The main aim of PPP is to provide service to the public in more efficient and cost-effective manner.
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Importance of PPP

- PPP helps in the development of public sector infrastructure in more efficient and cost-effective manner.
- It allows both government and private sector to work for public and generate timely solutions to the problems.
- It provides a unique collaborative way for public management.

- It also helps in globalization.
 - It ensures balance between risk and reward for both government and private sector through risk sharing mechanism.
-

Safety, Risk and Benefit Analysis

Safety

- Safety refers to the condition of being protected from physical, social, financial, emotional, occupational or educational failure, damage, error, accidents or harm.
 - It defines the controlled mechanism to achieve acceptable level of risk.
 - Safety is the first thing to maintain while delivering any engineering products.
 - For egg: during the development of any software product by an engineer, he/she must review the risks involved in the project. He/she must guarantee that the product will not harm any people or society in any way.
-

Risk

- Risk is the potential that a chosen action will lead to a loss.
 - Every project has some sort of risk associated with it.
 - Risk management is the process to identify, evaluate and prioritize risks and then coordinate so as to minimize, monitor and control the probability or impact of the risks on the projects.
 - The sources of risk are financial uncertainty, project failure, legal liabilities, accidents, natural disasters, and so on.
-

Risk-Benefit Analysis

- Risk benefit analysis is the analysis made by comparing the risk of a situation to its related benefits.
- A certain level of risk is acceptable in any project.
- A project is undertaken if the risk in the project is in acceptable level and has more benefits.

Development and Environment

Sustainable Development

- Sustainable development is defined as the development activities that meets the needs of the present without compromising the ability of future generations to meet their own needs.
- It concerns development activity with respect to environment and economic growth.

Environmental Impact Assessment

- Environmental impact assessment is the assessment of the possible positive and negative impact that a proposed project may have on the environment.
- It helps to predict environmental impacts at early stage in project planning and design.
- It helps in finding the proper control solutions to reduce adverse effects of the project on environment.

EIA Process

1. Screening (Determining whether EIA is needed or not)
2. Scoping (Determining the scope for EIA)
3. Prediction and Mitigation (Prediction and mitigation of various environmental impacts)

4. Management and Monitoring (Plan for managing and monitoring environmental impacts)
 5. Audit (audit of EIA process is carried out after implementation)
-

SWOT Analysis

- SWOT stands for Strength, Weakness, Opportunities and Threats. - SWOT analysis is a strategic planning method used to evaluate strength, weakness, opportunities and threats involved in a project.
 - It helps to identify all the internal and external factors that are favorable and unfavorable to achieve the objectives of the project.
 - Strength and weakness determine the internal factors.
 - Opportunities and threats determine the external factors.
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Conflict and Dispute Management

- Dispute occurs when one party claims or demands while the other party contradicts the claim.
 - Dispute is caused in engineering profession for the following factors:
 1. Cost in time, money and lost opportunities
 2. Image and uncertainty
 3. Behavior
 4. Employment and cash flow
-

Process to resolve dispute

1. Amicable settlement
2. Adjudication (An arbiter reviews evidence and argumentation, to come to a decision)
3. Dispute resolution board
4. Arbitration (Method of resolving disputes outside the court; a dispute is submitted in agreement of both parties, to one or more arbitrators who make a binding decision on the dispute)
5. Litigation (Court)
 - Any dispute should be settled amicably.
 - If the dispute cannot be solved amicably, adjudicator should be used. (price up to one hundred million rupee)
 - Otherwise, a 3-member dispute resolution committee should be established. (price more than one hundred million rupees)
 - If a person is not satisfied with decision from adjudication or dispute committee, such dispute should be resolved through arbitration pursuant to prevailing law.
 - The disputes leading to arbitration includes:
 1. Late payment by employer
 2. Denial to pay interest on late payment even if provided in contract
 3. Instructions given to contractors are unclear
 4. Delay in providing design

Chapter-7 Case Studies based on Engineering Practices

Example Case Studies

Example 1:

A factory was using a chemical in making a product. The storage tank of the chemical waste, which was hazardous to health and environment, had a leakage. During inspection Er. A came to know leakage that had already taken place that might cause adverse impact on health and hygiene of the surrounding. You informed your boss about the event. Hints you that you may have to be out of the job if the case would go into the hands of social reformers. If you were Er, what you would do? Discuss.

Facts

- *Storage tank has Leakage.*
- *Leakage cause adverse impact on health of people and e environment*

Immediate Action

- *Inform to boss about the event*

Alternative and Consequences

- *Inform to public (May cause loss in job)*
- *Make it confidential (Public harm)*

Discussion

- *The situation gives rise to moral dilemma.*

- As per the ethical decision making, the priority should be:

- a) Society
- b) Profession
- c) Organization
- d) Individual

- On making the event confidential, it would result harm to the society, their health and the environment. And it is unethical as per the professional code of conduct and code of ethics.

- On providing information to social reformers, it would harm the prestige of the organization to whom I am working for and also, I would lose job and cause individual damage.

- Based on these grounds, I would take the following initiatives:

1. Firstly, I would negotiate with the boss of organization so as to provide compensation to those who are harmed by the event and also immediate solution for the event so as to prevent further harm. This decision would be unofficial in terms of all society, profession, organization as well as individual.

2. If the boss neglects to negotiate, I would look forward to social informers so as to provide my service for social benefits. This would be beneficial for society and in accordance to professional code of conduct, but may be harmful for organization and individual.