Professional Ethics in Engineering

Background (5 hours)

1.0 Background

1.1 History of Engineering practice

1.2 Cultural, Political, Societal motivations and limitations

1.3 Impacts and consequences of technology on society

1.4 Education and training of technologists, scientists and engineers

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1.1 History of Engineering Practice

- Engineering: Application of data, information, knowledge and technique for practical beneficial use.
- “Beneficial for whom?” and “Are the benefits sustainable?” are relatively modern issues in Professional Engineering Practices.
  - If a particular engineering project benefits only a few persons in a society, is it justifiable? If an engineering project’s benefit is unsustainable, should the society promote it?

1.1 History of Engineering Practice

Short History of Engineering Practice

- Concrete is used for arched bridges, roads and aqueducts in Rome (1200 BC-1 AD)
- Gunpowder use improved (1-1000 AD)
- Manufacturing and use of silk and glass (1000-1400 AD)
- Toilet, telescope, vacuum, and Gas Law (1400 – 1700 AD)
- Industrial revolution, steam engine, Society of Engineers (UK), cast iron building (1700-1800 AD)
- Mechanical automation, railroad, telegraph (1800-1825 AD)
- Reinforced concrete, synthetic plastic material, Oil well, mass production of steel, typewriter (1825-1875 AD)
- Telephone, light bulb, gasoline engine, automobile (1875-1900 AD)

1.1 History of Engineering Practice

Short History of Engineering Practice (continued…)

- Aeroplane, diesel engine, commercial flight, mass production of automobile (1900 – 1925 AD)
- TV, atom bomb, transistor (1925-1950)
- Computer, artificial satellite, moon landing, electronic hand held calculator (1950-1975)
- Supersonic plane, reusable rocket, artificial heart (1975-1990)
- Robot, under-sea train, internet, email, GPS (1990-2000)
- 2000 onwards: Exponential expansion in application of engineering affecting daily life: Continuous connection anytime, anywhere, mobile phone, electronic surveillance of equipment and people, automation of virtually everything, instant access to data and information, service industry dominating manufacturing.

1.2 Cultural, Political, Societal motivations & limitations

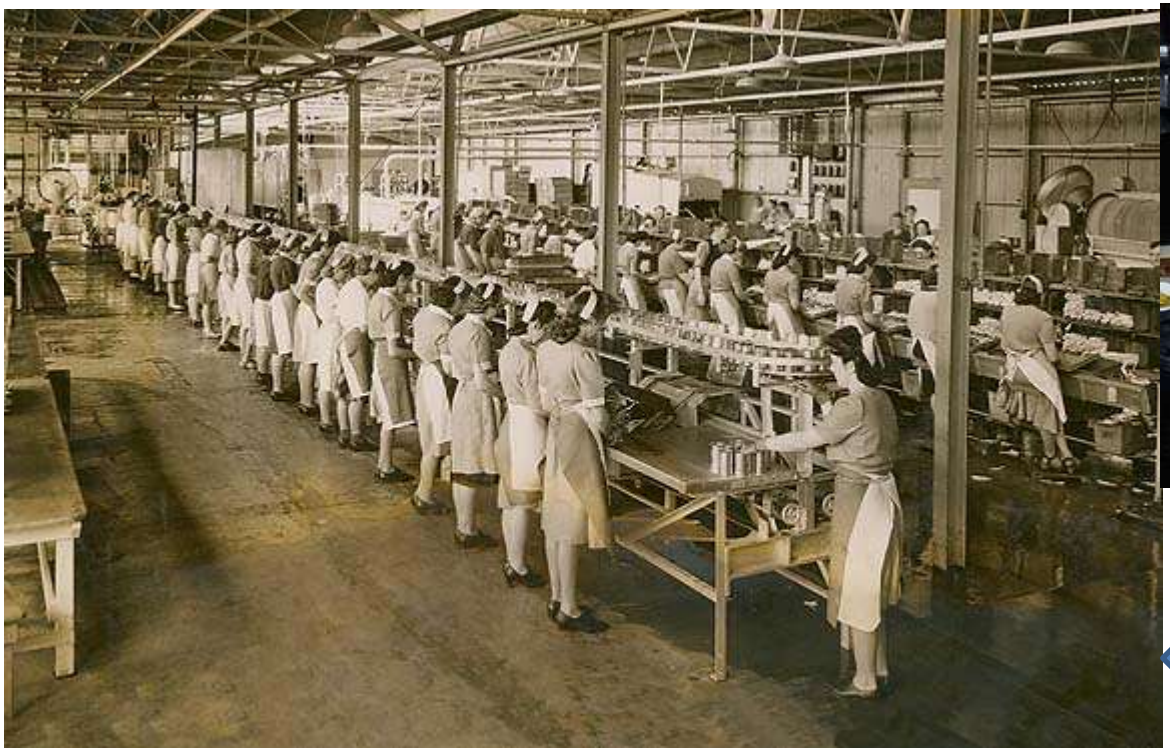
- Cultural practices, customs, rituals, and belief systems can motivate or demotivate development and adoption of science and technology.
  - low value of time and punctuality, low value of work, intellectual property right and copy right, research
  - more value to ritual, predestination, formality, religion, tradition, caste
- Political systems can create conducive environment or hurdles in development and use of science and technology.
  - Authoritarian, despotic, repressive, lack of rule of law, impunity, irregular and selective application of law, lack of freedom of expression and choice frequently changing policies and rules, vague regulations
- Social norms and values can encourage or discourage (assign arbitrary limits) people to be professional engineers.
  - Gender-class-caste roles, defective social norms and values, gap between rich and poor, access to health and education, social security, conflict, rent seeking culture, suspicion of new ideas and technologies

1.3 Impacts and consequences of technology on society

- The impacts and consequences of technology on society are multifaceted (consequences are positive or negative, depending on use or abuse, or ability to prevent abuse)
- Impact on social values and family structure
- Impact on cultural norms
- Impact on transportation of goods and services
- Impact on communication and information generation
- Impact on production means and price of goods

1.3 Impacts and Consequences of Technology on Socio-economic parameters (positive): a) Agriculture

Impact on	Impact
Food Production	Mechanized, increasing, Green Revolution, GMF, vertical hydroponic
Food Processing	Food processing getting complex, requiring industrial management
Food Preservation	Food security increasing, for most, better food preservation
Commercialization	From subsistence to cash crop, patented seeds and food processing techniques
Food Variety	Increasing, year round availability, no more seasonal
Fertilizer/Pesticide	From organic to chemical, pesticide use increasing
Water use	Increasing due to cash crops & agricultural intensification; reduced by micro-irrigation



From traditional to modern food processing

1.3 b Impact on Communication

Impact on	Impact
Information generation and dissemination	Increasing access to information
Mass communication: Newspaper, Magazines, FM Radio, HAM radio, TV, instant/breaking news	Enhanced public awareness, timely information to people
Internet and Social Media	Increased access to information, social media influencing design of communication techniques
Telephone, mobile phone	Increased and easier access to telephone
Virtual Meeting, virtual reality, tele-medicine	Less need of physical presence in meeting, distance medicine services and remote controlled operation possible

1.3 d Impact on Information Generation, Storage and Dissemination

Impact on	Impact
Information access	Increasing access to information through multiple mediums
Storage, virtual storage	Tape, Floppy disk, CD, DVD, External hard disk, Dropbox, Cloud storage, mailbox
Generation	Information generation growing exponentially, automatic data logging, GIS, GPS, Satellite Images, Remote sensing
Dissemination	e-paper, interactive TV, internet, social media

1.3 e Impact on Dispute/Conflict Resolution

Impact on	Impact
Warfare	Increased use of gun power, rockets, missiles, drones, improvised explosive devices, chemical-biological
WMD	A-bomb, H-bomb, nuclear bomb made but not yet used (except two in WW II), Star War, MAD policy
Evidence	Evidence recorded in electronic media

1.3 f Impacts on Family Structure, Culture and Livelihood

Impact on	Impact
Family	Family relation more complex, IV-fertilization, test-tube baby, cloning, surrogacy, same sex marriage, family size reducing, micro-family getting possible, life span increasing, change in status of female and disabled
Tradition/ Culture	Traditions-values challenged and altered or replaced, heritage preservation better
Recreation	Traditional dances/music/drama/games giving ways to movies, video games, theme parks, pay per view
Social Norms and Values	Social norms and values increasingly challenged and altered or replaced, social class structure disintegrating, new economic class emerging
Language	International language use increasing, language getting standardized, brail script & sign language use increasing
Livelihood and living standard	Livelihood diversification & specialization increasing, Living standard & HDI increasing, poverty decreasing, employment opportunity increasing, price decreasing


World solar power capacity increased 35% last year
Global Cumulative Installed Solar Capacity 2000 -2013 (MW)
2,050
2,614
3,700
5,085
6,629
9,146
15,795
23,108
40,183
70,168
99,690
139,697
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
earth


The Digital Disruption Has Already Happened
• World's largest taxi company owns no taxis (Uber)
• Largest accommodation provider owns no real estate (Airbnb)
• Largest phone companies own no telco infra (Skype, WeChat)
• World's most valuable retailer has no inventory (Alibaba)
• Most popular media owner creates no content (Facebook)
• Fastest growing banks have no actual money (SocietyOne)
• World's largest movie house owns no cinemas (Netflix)
• Largest software vendors don't write the apps (Apple & Google)

Electrical Vehicle

- First electrical vehicle: 1937 Robert Davidson
- In 1912: 38% of vehicles in US were electrical
- Volvo: No gasoline based vehicle (GBV) production from 2019 (only two years from now)
- France: Ban on use of GBV from 2040
- Germany: Ban on trade of GBV 2030
- Netherlands, Norway: Ban on trade of GBV from 2025
- India expected to follow suit.

Computer and Computer Crimes

Computer:

- Modeling, simulation (visualization of potential impacts and solution before the event occurs and solutions implemented), design, solution techniques (FDM, FEM), Management Information System, Spatial planning using GIS, computer crimes, intrusion on personal privacy, data mining, data theft,

Effects: information generating, storing and dissemination

- Design of materials using simulation
- Electronic equipment

Electronic Transaction Act 2063 (2006) has listed the following acts under the Computer Crime

- Theft, damage or alteration of computer source code
- Unauthorized access to materials on computer
- Destruction and computer and information system
- Publication of illegal materials on electronic form
- Violation of confidentiality
- Posting of false information
- Submitting or showing forged license or certificate
- Non-submission of the document or other materials
- Computer fraud

1.4 Education and training of technologists, scientists and engineers

- Continuous education and training (E&T) is a regular process for the technologists, scientists and engineers (TSE)
- New concept, knowledge, technology, hardware and software, materials, equipment, tools, gadgets, keep coming in the market. New policies, acts/laws, rules and standards are periodically adopted. The TSE need to keep up with the latest developments to prevent themselves from being out of date.
  - Information & Technology Policy 2000; Science & Technology Policy, 2005
  - The Electronic Transactions Act 2006
  - Electronic Transactions Rule 2007
  - Nepal Electronic Cheque Clearing Rule Book, 2011 (ECC Rule)
  - e-governance, e-bidding, e-procurement, e-banking, e-sewa,
  - High Level Commission for Information Technology
- Nepal Administrative Staff College caters to the continuous E&T needs of administrative staff; no similar institute for TSEs in Nepal.
- Continuing Education Division/IoE partially caters to the needs of TSEs
- Currently a myriad of different organizations are filling the gap of lack of formal system of E&T for TSEs in Nepal.

Nepal is a poor, underdeveloped nation, but has enacted a good E-commerce law—the Electronic Transactions Ordinance.[181] The following provisions are especially noteworthy: the Information Technology Tribunal and Appellate Tribunal, possibly the best system of specialized computer dispute resolution in the world; the explicit claim of "long arm" jurisdiction over foreign parties involved in E-commerce disputes with citizens of Nepal; the comprehensive list of computer crimes; compulsory licensing of CA's; the Controller's mandatory annual audit of CA's; and the Controller's right to demand a subscriber to turn over his private key in specified situations.

https://books.google.com.np/books?id=kRtPAAAAQBAJ&pg=PP65&lpg=PP65&dq=electronic+trensactions+rule+nepal&source=bl&ots=CFM_zUvWGk&sig=FympL7SyUAMwkE_C6t49h-AxAHw&hl=ne&sa=X&ved=0ahUKEwiy4tvA5JHVAhVIu7wKHXpgCdMQ6AEIajAJ#v=onepage&q&f=false

Potential Questions

- List the type of cultural, political and societal practices which motivate development of science and technology in a society.
- List the type of cultural, political and societal practices which limit development of science and technology in a society.
- What is the impact of development of ICT in social values?
- What is the impact of computers in mechanized production, and how has it impacted society?
- What are the different forms of computer crimes, and how has computer crime impacted society?
- What should be the modality of the education and training of the technologists, scientists and engineers?
- What specific type of training should the electronics engineers and/or electrical engineers be provided?

Professional Ethics in Engineering

Profession and Ethics (3 hours)

2.0 Profession and Ethics

2.1 Definition and Characteristics

2.2 Codes of ethics and guidelines for professional engineering practice

2.3 Relationship of engineering profession to other professions (e.g. fellow engineers, clients and contractors)

2.4 Moral dilemma on ethical decision making

2.5 Negligence and Liabilities

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2.1 Definition and Characteristics

- **Profession**: An occupation carried out with a systematic knowledge acquired through specialized training or education and experience and practicing the same.
- **Professional**: A person practicing a profession in area of expertise.
- **Professionalism**: The content of profession with moral and ethical behaviours.
- Acts of a professional are evaluated by the public.
- Professionals follow their code of conduct, and standards and norms.
- Professional have their own culture
  - Through regular interactions, communications and experiences in same field

2.1 Definition and Characteristics

- Ethics: generally concerned with rules or guidelines associated with a profession.
- Ethics is normally clear; ethical and unethical behaviours are easier to distinguish, hence no ethical dilemma, as opposed to moral dilemma.
- Ethical acts are legal and moral; but a particular moral act is not necessarily ethical/professional.

2.2 Codes of ethics and guidelines for professional engineering practice

Different professional engineering societies have issued Code of Ethics for their members. Examples: ABET, IEEE, ASME, NEC, NEA, SCAEF, FCAN, CAN, …

Accreditation Board of Engineering and Technology (ABET) Code of Ethics for Engineers:

1. Engineers shall hold paramount the safety, health, and welfare of the public in the performance of their professional duties.
2. Engineers shall perform services only in the areas of their competence.
3. Engineers shall issue public statements only in an objective and truthful manner.
4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the profession.
7. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.

IEEE Code of Ethics:

1. to accept responsibility in making decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;
5. to improve the understanding of technology; its appropriate application, and potential consequences;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons and to not engage in acts of discrimination based on race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression;
9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

http://www.ieee.org/about/corporate/governance/p7-8.html

NEC code of ethics

1. ***Discipline and Honesty***: The Engineering sevice/profession must be conducted in a disciplined manner with honesty, not contravening professional dignity and well-being.
2. ***Politeness and Confidentiality***: Engineering services for customers should be sealt with in a polite manner and professional information should remain confidential except with written or verbal consent of the customers concerned. This, however, is not deemed to be a restriction to provide such information to the concerned authority as per the existing laws.
3. ***Non-discrimination***: No discrimination should be made against customers on the grounds of religion, sex, caste or any other things while applying professional knowledge and skills.
4. ***Professional Work****:* Individuals should only do professional work in their field or provide recommendation or suggestions only within the area of theri study or obtained knowledge or skills. With regards to the works not falling within the subject of one's profession , such as works should be recommended to be done by an experts of the subject matter.

NEC code of ethics

5. ***Deeds which may cause harm to the engineering profession***: With the exception of salary, allowance, and benefits to be received for services provided, one shall not obtain improper financial gain of any kind of conduct improper activities of any kinds, which would impair the engineering profession.
6. ***Personal responsibility***: All individuals will be personally responsible for all works performed in connection with his/her engineering profession.
7. ***State name ,designation and registration number***: While signing the documents or descriptions such as the design , map , specification and estimates etc ralating to the Engineering profession , the details should include, the name , designation and NEC registration No. and should be stated in a clear and comprehensive manner.
8. ***No publicity or advertisement to be made which cause unnecessary effects:*** In connection with the professional activities to be carried out, no publicity or advertisement shall be made so as to cause unnecessary effects upon the customers.

Learn these 8 CoEs by heart

2.3 Relationship of engineering profession to other professions (e.g. fellow engineers, clients and contractors)

Relationship with fellow engineers:

- Professional relationship with all the engineers, regardless of their status, and even if the fellow engineer is a close relative
- "Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputations, prospects, practice or employment of other engineers, nor indiscriminately criticize the work of other engineers"
- Criticize cautiously and objectively with respect to the person's professional status
- Have professional relationship
  - Encourage fellow engineers to follow Code of Ethics
  - Guide, train and orient freshly graduate engineers
  - Create platform for information and knowledge sharing
  - Support fellow engineers in professional development

Engineer's relationship with Client:

- Strict professional relationship, even if the client is closely familiar (relative, friend)
- No discrimination among client based on culture, race, religion, sex, …
- Work in the best interest of the client with loyalty with legal limit
- Deliver in time, with quality
- Not expect extra favour for works performed as per an agreement
- "An engineer shall not accept financial or other compensation from more than one party for services rendered on one project unless the details are fully disclosed and agreed by all parties."
- Supervise work and prevent misuse/abuse of client's property/trust
- Assist in decision making by providing options
- Warn potential risks of decisions
- Going beyond ToR, when professionally required
- Keep information confident, unless required by law
- Full disclosure of potential conflict of interest, if any
- Not take a client for granted: remembrance of bad experience lingers much longer than a good experience

Engineer's relationship with Contractor:

- Strict professional relationship, even if the contractor is closely familiar (relative, friend)
- Provide due respect to the contractor
- No discrimination among contractors based on belief, race, religion, culture, sex, sexual orientation, …
- Provide all the detailed drawings, quantity and quality (including specification) of works (goods and services) to the contractor in time
- Check and approve running bills in time, as per specification
- Not expect or accept (directly or indirectly) extra favour of significant value, for works performed as per an agreement
- Supervise work and prevent use of sub-standard methods and materials being used
- Participate in co-decision making by providing options when necessary
- Assist the contractor when variations are technically needed
- Warn potential risks of decisions/actions
- Going beyond ToR, when professionally required

2.4 Moral dilemma on ethical decision making

- Ethical decision, which is legal and follows all the prevailing rules, regulations, and standards, and is beneficial to the client, may result in (a) environmental damage beyond the limit what the engineer considers to be moral, (b) reduced public safety, (c) loss to helpless, voiceless, marginalized stakeholders. Such a situation creates a moral dilemma to an engineer.

2.5 Negligence and Liabilities

Negligence in duty (dereliction of duty) results in liabilities to stakeholder whose life, health or property is damaged.

Conditions for establishment of professional negligence:

- **Duty**: Unless there is a contractual duty to perform a work there is no negligence in the performance of the work.
- **Breach**: Unless there is a breach of the terms and conditions of an agreement, professional negligence cannot be proved.
- **Damages**: Unless there is a specific damage to the claimant, professional negligence cannot be established.
- **Proximate cause**: There should be direct (one-to-one) relation between the specific action of a professional and the damage resulted by the action to the claimant.

2.5 Liabilities of engineers in project design, construction and implementation

Three sources of liability:

a) **Liabilities due to contract**: liable to fulfill all terms of contract; if there is no contract, legally, there is no liability under this category. An engineer is liable for loss of damage due to breach of contract clauses. Contract law imposes liability on a party for promises that the first has made to another party; liability related to loss of a single person's life/property.

b) **Liabilities due to criminal law**: liable to follow all prevailing laws of nation, breach of law related to design, construction and implementation of design can result in criminal case, whether there is damage or not. Criminal law imposes liability on a party due to illegal/ criminal acts; defendant has a liability to the government/state.

c) **Liabilities due to tort**: liable to prevent customers/users of products and services from loss or damage; even if there is no specific contract and no laws have been breached, an engineers can be held liable for loss or damage to the customer due to the use of services and products designed, constructed, or implemented by the engineer. Pre-information or pre-warning or disclaimer can prevent an engineer from liability due to tort. Tort provision is a legal mechanism for compensating individuals injured by others, whether deliberate or not; directed toward the compensation of individuals, rather than the public.

Vicarious and Partnership Liability

Two types of liability:

- **Vicarious Liability**: A company or a contractor/sub-contractor is liable for the acts of its own and its employees. Three tests are used to ascertain the degree of vicarious liability.
  - Control test: degree of liability depends on level of control a company has on its staff or contractor; the more control a company has over a person (employee) the more liable the company is.
  - Business integration test: degree of liability depends on level of business integration; the more the work of a person is integrated into the work of a company, the more liable the company is for the acts of the person, even if the person is not a direct employee of the company.
  - Multiple test: Control test, business integration test, and other related factors are taken into consideration to determine the degree of liability.
- **Partnership Liability**: Liability of the partners in tort: The partners of a company are liable for the acts of one (or more) of its other partners.

2.5 Liabilities of engineers in project design, construction and implementation

Liabilities of an engineer in project design

- **Fitness for purpose**: The design of a project (overall and component-wise) should be proper to serve the purpose of the project.
- **Negligent misstatement**: The designers and professionals are expected not to make any negligent or unsubstantiated misstatements.
- **Statutes, bylaws and building regulations/codes**: It is the duty of the designers and professionals to make themselves fully aware of the statutes, bylaws and codes related to their professional practice.
- **Examination of site above and below the ground**: Before finalizing a design, a designer should know the conditions of the site above and below the ground.
- **Public and private rights**: The design of a project should not contradict with the public and private rights of the client and others who may be affected by the design implementation.
- **Plans, drawings and specifications**: The design should include detailed plan, drawing, and specification of each component of the project and equipment
- **Materials (quantity, quality and availability)**: The details of the quantity and quality of materials to be used in a project should be specifically mentioned. The availability of the materials should be kept in mind while selecting the material types.
- **Novel, risky design and employers' interference in design**: A designer may choose to use novel and risky design, and may decide to incorporate employer/client's idea in the design. However, the designer is ultimately responsible for the safety & fitness for purpose of the design implementation.
- **Revision of design during construction**: Even if the design is revised during construction, the designer is ultimately responsible for the safety & fitness for purpose of the design implementation.

Liabilities of engineers in project construction and implementation

- Completion of project in time, within budget
- With quality: material, workmanship, method of construction
- Consistency: in quality, form
- Safety and welfare of project workers, people living in and around project area, and people travelling through or visiting the project area
- Follow applicable laws, rules, regulations, guidelines, conventions, codes and bylaws
- Meet social obligations

…engineer must struggle to design in such a way as to avoid failure, and, more importantly, catastrophic failure which could result in loss of property, damage to the environment of the user of that technology, and possibly injury or loss of life…
http://www.matscieng.sunysb.edu/disaster/

समयमै काम पूरा नगरेपछि पप्पु कन्स्ट्रक्सनलाई एडिबीले तिरायो ५ करोड

साउन ६, २०७४ बाँके:

एसियाली विकास बैंक (एडिबी) ले जमुनहा–राँझा सडक खण्ड निर्माणको जिम्मा पाएको पप्पु कन्स्ट्रकसन जेभीलाई ५ करोडभन्दा बढी रुपैयाँ हर्जाना तिराएको छ। सम्झौता अनुसारको काम समयमा पूरा नगरेपछि एसियाली विकास बैंकले पप्पु कन्स्ट्रकसन जेभीलाई करिब ५ करोड ५० लाख रुपैयाँ हर्जाना तिराएको मध्यपश्चिम क्षेत्रीय सडक निर्देशनालय डिभिजन कार्यालय नेपालगन्जका डिभिजन प्रमुख अर्जुनकुमार बमले जानकारी दिए। 'हर्जाना लगाउनु भनेको कारबाही नै हो, यसले अन्य योजनाको ठेक्कापट्टामा पनि असर पार्न सक्छ,' उनले भने। उनले पप्पु कन्स्ट्रक्सनको ठेक्का जुलाई, २०१६ सम्म मात्र भएकोले अब पप्पु र एसियाली विकास बैंकबीच कुनै सम्बन्ध नरहेको बताए। पप्पुले ५७ करोड रुपैयाँमा राँझा–जमुनहा सडकखण्ड कालोपत्रे गर्ने ठेक्का लिएको थियो। मापदण्डअनुसार निर्माण नगरेको प्रमाणित भएपछि एसियाली विकास बैंकले उसलाई एक करोड रुपैयाँ मात्र दिने निर्णय गरेको थियो। हर्जानाबापतको रकम असुली हर्जाना बापतको रकम एडिबीले असुली गरिसकेको छ। काम गरेबापत उसले पाउने रुपैयाँ हर्जानामा कटाइएको छ। सडक निर्माणका लागि ठेक्का लिने क्रममा जम्मा गरेको रकम पनि राजस्व कार्यालयमा पठाइएको सडक डिभिजन कार्यालय नेपालगन्जले जनाएको छ। बाँकी रकम पिभिसीलगायत पप्पुको बैंक खाताबाट असुली गरिएको डिभिजन प्रमुख बमले बताए।

Read more at: http://thahakhabar.com/news/20256

Potential Questions

- What are the essential elements of a professional person?
- What are the characteristics of an ethical decision making?
- Discuss Nepal Engineering Council's code of ethics.
- What should be the nature of the relationship between an engineer and a client?
- What are the conditions necessary to prove professional negligence in engineering practice?
- Discuss, with examples, three basic sources of liability of an engineer.
- Discuss the objectives of tort liability.
- Discuss the vicarious liability and partnership liability, with examples from electronics and/or electrical engineering applications.
- Discuss, with an example, a case of moral dilemma when making ethical decisions.
- Discuss the liabilities of an engineer in project design and project implementation.

Professional Ethics in Engineering

Professional Practices in Nepal (4 hours)

3.0 Professional Practices in Nepal

3.1 General job description of an engineer in public and private sector

3.2 Public and Private sector practices

3.3 Roles of Professional Associations

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3.0 Professional Practices (in engineering) in Nepal

- Professional Practices of engineering in Nepal are guided
- formally by the laws/acts, guidelines, directives, cabinet decisions, standards and codes,
- Guidelines, and code of Ethics of professional bodies like Nepal Engineers' Association, SCAEF, FCAN, CAN, IEEE
- informally by the practices in specific institutions

3.1 General job description of an engineer in public and private sector

General duties of an engineer are mainly:

- Design and estimate of specific project, infrastructure etc.
- Preparation of technical specification, tender documents, contract document, agreement paper
- Evaluate and supervise the project assigned
- Allocation of resources
- Work as a member of investigation committee
- Prepare Annual Plan or Project specific plan of activities
- Provide suggestion and recommendation in area of expertise

3.1 General job description of an engineer in public sector (Gazetted Third Class)

- Perform preliminary and detail survey, design and estimate
- Execute and assign for execution of project works
- Conduct various programs for increasing people's capacity
- Prepare Progress Report , Feasibility Report , Final Report, Monitoring and Evaluation report etc.

3.1 General job description of an engineer in public sector (Gazetted Third Class)

- To execute other jobs planned specifically for engineers as the nature and case may be
- To monitor and evaluate on going projects
- To facilitate donor agencies is involved
- To monitor and coordinate the operation and maintenance of facilities
- To execute and perform works and jobs assigned by immediate superiors

3.1 General job description of an engineer in public sector (Gazetted Second Class)

- Planning, programming and execution of works
- Research on technology, cases, various skills for upgrading
- Administrative activities
- Financial administrative activities

3.1 General job description of an engineer in private sector

- Coordinate works between stakeholders, clients, consulting and contractors
- Layout works, to survey and to estimate
- Supervise, monitor, and control works
- Control quality, to assess and report to concerning authorities
- Prepare bills as a quantity surveyor
- Plan project and report progress
- Prepare technical report and prepare claims if any
- Conduct necessary training regarding site work and office organizations system to new staffs
- Overall management of construction project etc.

Typical work assignments

Electrical engineers typically do the following:

- Design new ways to use electrical power to develop or improve products
- Perform detailed calculations to develop manufacturing, construction, and installation standards and specifications
- Direct the manufacture, installation, and testing of electrical equipment to ensure that products meet specifications and codes
- Investigate complaints from customers or the public, evaluate problems, and recommend solutions
- Work with project managers on production efforts to ensure that projects are completed satisfactorily, on time, and within budget

Electronics engineers typically do the following:

- Design electronic components, software, products, or systems for commercial, industrial, medical, military, or scientific applications
- Analyze customer needs and determine the requirements, capacity, and cost for developing an electrical system plan
- Develop maintenance and testing procedures for electronic components and equipment
- Evaluate systems and recommend design modifications or equipment repair
- Inspect electronic equipment, instruments, and systems to make sure that they meet safety standards and applicable regulations
- Plan and develop applications and modifications for electronic properties used in parts and systems in order to improve technical performance

https://collegegrad.com/careers/electrical-and-electronics-engineers

3.2 Public and Private sector practices

- The scope of work carried out by the engineers in the public and private sector covers many areas. The scope of work of each public and private organization is listed in their website
- In general, the public organization, or an organization which receives public fund, is bounded by Public Procurement Act/Rule.

3.2 Private sector practices

- In the open market system, there are thousands of private organisations and firms working in engineering sectors
- Entrepreneurs have used engineers to produce in large quantity in economic investments,
- Private sector working more efficiently under strict supervision and motivations
- More than 50 private engineering colleges affiliated to 7 universities - governmental and nongovernmental.
- Numerous consultancies, construction companies and firms
- Many computer institutes, training institutes, e-business organisations, hospitals, research centers have employed engineers

Sample List of Public Organizations (ministries) where engineers are involved/employed

1. Finance
2. Home Affairs
3. Foreign Affairs
4. General Administration
5. Law and Justice
6. Land-reform and Land Management
7. Women, Children and Social Welfare
8. Education and Sports
9. Defence
10. Health
11. Labor and Transport
12. Industry, Commerce and Supply
13. Agriculture and Cooperative
14. Population and Environment
15. Culture, Tourism and Civil Aviation
16. Irrigation
17. Energy
18. Physical Infrastructure and Transports
19. Forests and Soil Conservation
20. Science and Technology
21. Information and communication
22. Federal Affairs and Local Development

Note: The name of the ministries keep changing. Many more engineers are employed in the departments under the ministries.

Sample List of Public/Semi-Public Organizations where engineers are involved/employed

1. Nepal Telecommunication Authority
2. Nepal Airlines Corporation
3. Diary Development Corporation
4. Nepal Industrial Development Corporation
5. Nepal Electricity Authority
6. Nepal Rastra Bank
7. Agricultural Development Bank
8. Rastriya Banijya Bank
9. TU/PU/PU/MWU/FWU/KU
10. University Grants Commission
11. Hetauda Cement Factory
12. Udayapur Cement Factory
13. Nepal Telecom
14. CAAN
15. Diary Development Corporation
16. Investment Board Nepal
17. Salt Trading Corporation
18. Industrial Estates (Balaju, Patan, Pokhara, Hetauda, …)
19. Central Bureau of Statistics
20. Nepal Bureau of Standards and Metrology

3.3 Roles of Professional Associations

- Regulate professional practices through enactment of rules and reward and punishment system
- Develop norms, standards, and codes of professional practices
- Monitor practices and performance
- Orient new professional members
- Enhance professionalism through professional development programs
- Provide platform for knowledge sharing and mutual learning
- Provide suggestions for development and update of policies/ acts/ laws/ rules/ regulations/ codes

Professional Associations Regulate Profession

One of the fundamental roles of professional associations is to regulate the professional practices of the persons or institutes engaged in a particular profession. E.g., the FCAN regulates the ways contractors, act when performing duties related to their profession, through:

- developing guidelines & procedures to be followed by its members,
- developing minimum standards of profession,
- developing and issuing codes of conduct for FCAN members,
- developing and approving written/unwritten rules of the profession,
- preparing standard procedure/formats of submitting bids,
- monitoring and evaluating compliance of the rules, and
- taking actions against breakers of the rules and/or code of conduct.

NEC and NEA regulate engineering profession by developing policies, plans/programs for the smooth functioning of engineering profession and execute them. The NEC regulates higher engineering education in Nepal through evaluation, recognition and monitoring of academic institutes providing formal engineering education.

3.3.1 Roles of professional organizations in induction of new entrants into the profession

Another major role of the professional associations is to guide new entrants into the profession by

- providing orientation and training,
- guiding on the conventions of the profession,
- providing information on the dos and don'ts of the profession,
- potential pitfalls when the Code of Conduct are not followed,
- linking the new comers with established members of the profession.
- Guiding on general job description and employers' expectation from new recruits
- Training new entrants for job seekers, proposal writing, bidding, project terms and conditions negotiation, etc.

3.3.2 Upgrading and maintaining the professional and technical competence of members of professional association

Professional societies take various steps for upgrading and maintaining the professional and technical competence of its members by

- Organizing regular professional development courses and continuing education programs, like running Engineering Staff College
- Organizing skill development oriented training programs
- Organizing regular talk programs to share experiences and lessons learned from different projects
- Providing platform for its members to expose their works by organizing national and international seminars/workshops on regular basis
- Publishing technical journals and news bulletin
- Organizing exposure field visits to different projects
- Providing exposure to national and international experiences by organizing national and international visits to its members
- Proactively working with academic institutes on development and update of university curriculums
- Proactively working with research institutes for involving its members in research and development activities
- Proactively working with service providing organizations (consulting companies, contractors, material suppliers, software developers, equipment operators) to establish link of its members with established organizations.

3.3.2 Upgrading and maintaining the professional and technical competence of members of professional association

Some of the ways in which the professional associations in Nepal have been playing this role in Nepal are:

- Providing Continuing Education Programs (NEA, SCAEF, FCAN, CAN)
- Engineering Staff College (proposed by NEA, not yet fulfilled)
- Provision of Professional Engineer (NEC)
- Provision of periodic test as part of NEC registration renewal (proposed)
- Professional Development as part of evaluation of engineering colleges (NEA)
- Organizing professional meeting/seminar/conferences/conclave: (NEA, SCAEF, FCAN, CAN…)
- Organizing trainings, weekly lecture series (NEA);

http://www.neanepal.org.np/showmodule.php?what=weeklytalk&under=home

- Organizing workshop on specific issues related to engineering education in Nepal (NEC, AECON, OPEN, TUTA)

Some examples: Rapid Assessment Training after April 25, 2015 Gorkha Earthquake; recommendations after Jure Landslide

3.3.3 Providing technical expertise to public authorities in developing policies, acts, standards, project implementation procedures and international agreements and negotiations

- The legislators and other governmental organizations frequently seek technical expertise from professional associations in the development, drafting and amendments to the existing acts, rules, regulations, policies, guidelines, bylaws, provisions, plans and programs.
- NEC, NEA, SCAEF, FCAN, CAN and other professional organizations provide technical expertise to different government organizations, including legislators, as and when requested. When these professional associations do not have in-house expertise, they coordinate with individual (or institutional) members to provide such services.
- NEA and DPNet independently conducted study of Jure Landslide (Sunkoshi) in 2014 and submitted expert advice to deal with the disaster.

(https://drive.google.com/a/nec.edu.np/file/d/0B19Ck0L5dMSrUklZUDN2dk5lZUx6aEtCYnpmenp2TjFId2kw/edit)

3.3.4 Ensuring occupational health, safety and general welfare of the public

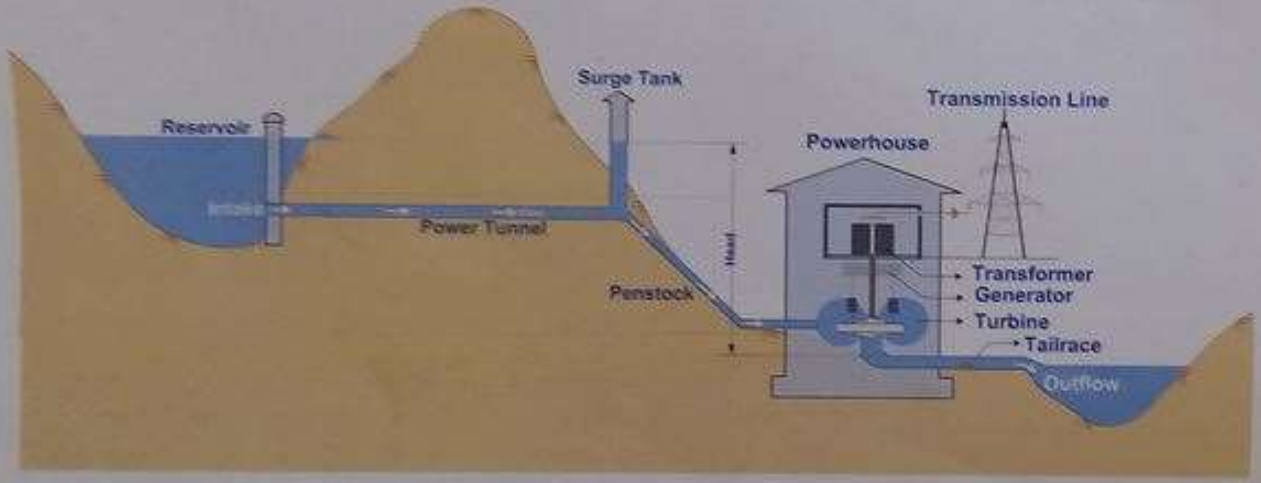
- The professional engineering associations are expected to play the role of monitors of quality of works of its members, including the matter of safety and general welfare of the public.
- When a particular member is found to violate the codes of conduct, compromise on quality of works, and neglect public safety and public welfare, the concerned professional engineering association can warn them, and reprimand/cancel their membership.
- NEC is planning to introduce a system of Accountability in Engineering Professional services.
- The standard design manuals, design procedures, building codes, including professional judgments will be evaluated as a part of safety and general welfare of public in engineering works.
- NEC/NEC/ SCAEF/FCAN etc. can monitor provision of occupational health, safety and general welfare of workers and general public in specific projects.

3.3.5 Role of professional societies in environment protection

- Raise awareness among society members, public decision makers, and legislators on environment & sustainable development issues; work with universities in developing environment protection courses
- Circulate environment protection related acts, rules and regulations to society members
- Study and publish results of impacts (short term and long term) of development works on environment
- Develop manuals and guidelines on design, operation and maintenance of development projects by considering environment protection
- Conduct training courses on environmental law compliance
- Conduct advocacy programs for environment sensitive development methods
- Monitor specific development projects from environment protection aspect and suggest improvements, if needed, in carrying out project works with environment compliance
- Award organizations with excellent environment protection records.

140	ACE Development Bank Ltd.	4441110/4445554	158	Dolma Advisor Pvt. Ltd.	4431376
141	Feedback Ventures Nepal Ltd.	4169104/4169106	159	Neupane Law Associates	4101631
142	Qiankang Allonward Hydro-Equipment Co. Pvt. Ltd.	4228816/4223570	160	Hydro Magus Pvt. Ltd.	9808953879
			161	ACME Technotrade Concern	5552413
143	Structo Nepal (P) Ltd.	5521192 /5542118	162	ChainLink Engineering Private Limited	16636267

Schematic layout of a typical hydroelectric power plant.



Mathematically, electric power generated by Q (m3/sec) amount of water falling under gravity through height H (m) is given as

$$Power\ (Watts) = \eta \times \rho \times Q \times g \times H$$

Where,

Q = Flow of water per unit time (Litre/sec or Cubic Metre/sec

η = Overall efficiency of the system, generally between 70% - 85%

ρ = Density of water, 1000 kg/m^3

g = Acceleration due to gravity, 9.81 m/sec^2

INDEPENDENT POWER PRODUCERS' ASSOCIATON, NEPAL (IPPAN)

PO Box: 20010, Heritage Plaza II, Kamaladi, Kathmandu, Nepal

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What information can you obtain from this photograph?

Self test

- Briefly discuss the code of ethics of Nepal Engineering Council.
- Explain the code of ethics applicable to engineering profession.
- What do you understand by the code of conduct? Describe the code of conduct for engineers.
- How do you judge the ethical standard of Engineers in Nepal? Describe the role of Nepal Engineering Council in maintaining ethical standard of Nepalese Engineers.
- Differentiate between the NEA and NEC with suitable examples.
- What are the meaningful roles of professional societies or associations? Why are they needed? Explain.
- Explain roles of Engineering council and Nepal Engineers Association. In what regards, they are different?
- What are the general job descriptions of engineers working in public sector?
- Describe the basic duties of an engineer.

Professional Ethics in Engineering

Chapter 4: Legal Aspects and Regulatory Environment of Professional Engineering in Nepal

(8 hours)

4.1 Nepal Engineering Council Act
4.2 Labor Law
4.3 Contract Law
4.4 Cyber Law
4.5 Public Procurement Act
4.6 Intellectual Property Right
4.7 Company Registration Procedures
4.8 Relationship to foreign firms working in Nepal
Electricity Act, 2049; Electricity Regulation, 2050

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August 2017

Updated: August 12, 2017

Legal Aspects and Regulatory Environment

Components of a Legal System

The legal system of a nation includes:

1. acts/laws, court decisions/precedents *(ain, kanun, nirnaya/najir)*
2. rules, regulations, bylaws, directives *(niyam, biniyam, nirdeshika)*
3. treaties, conventions, policies, *(sandhi, prachalan, niti)*
4. formation orders, ordinance, promulgations, *(adesh, adhyadesh, ghoshana)*
5. access to justice, freedom to choose legal advisor,
6. concepts of "innocent until proven guilty", "equal under law" and
7. implementation aspects, including consistency, of 1 to 6 above.

Nepalese Legal System

- In Nepalese legal system, a person is practically "presumed guilty until proven innocent". As soon as a person, or an officer, is charged of a crime, he/she is losses his/her official privileges, expected to resign from his/her post or automatically suspended till the case is "closed" by a court of law.
- The Nepalese society normally presumes a person guilty as soon as s/he is charged of a crime. People have very low level of faith on the impartiality of justice/legal system. Many persons found guilty by a court, but with good connection, roam in government offices, while persons with low access to resources waits for years, even decades, for court verdict on cases he/she files.

नेपालको कानून दैवले जानुन् ! सानालाई ऐन ठूलालाई चैन !!

4.1 Nepal Engineering Council Act

- **Regulate professional engineering practices**
- **No. of Chapters: 7, No. of Sections: 38**
- **Chapter 1: Definitions:**
- d. Engineer: a person who holds at least a Bachelor's Degree in an engineering subject from an academic institution recognized by the council.
  e. Engineering Profession: the profession to be practiced by the engineers who have acquired the technical knowledge and skill in the subjects
- g. Registered Engineer: the engineer whose name has been registered in the Registration Book.
- **Chapter 2:**
- **5: Constitution of the Council**
- **Chapter 3:**
- **15.Registration of Name:** The Subject Committee scrutinizes application as per Section 14, and recommends to NEC Board, which decides on registration. If decision is positive, the Registrar registers in the Registration Book.

4.1 Nepal Engineering Council Act

- **Chapter 3: Section 18.Name to be Removed from the registration:**
  a) mentally unsound,
  b) property divided among the creditors for failing to pay debts,
  c) charge of violating the code of conduct passed by 2/3rd majority,
  d) convicted by a court in a criminal charge involving immoral act,
  e) registered by fraud or error.

  Chapter 4: Section 23. Inspection of Examination:
  1) Before or after recognizing the certificate/degree, NEC can inspect examination system of the concerned academic institution.
  Section 24: Recognition to be withdrawn

- **Chapter 7: Section 30. Offences and Punishment and Penalties:**
  1) Practicing engineering without registration is an offence.
  2) The offender of 30-1 is liable to a punishment of up to Rs. 3000 or an imprisonment of up to 3 months or both.
  3) Offenders of the Act of other types can be fined up to Rs. 2000.

4.2 Labor Law, 2048 (1992)

- No. of Chapters: 11, No. of Sections: 92

Chapter 1: Preliminary:

- Enterprise: any factory, company, organisation, association, firm, … established for operating any industry, profession or service, with ten or more workers/employees
- Worker: a person employed on the basis of remuneration, and worker at piece-rate, contract or agreement.
- Minor: a person between 16 and 18 years of age

Labor Law 2073 (parliament approval August 11, 2017) (२७/४/२०७४) has updated provisions.

Chapter 2: Employment and job security

- **4.1**: advertise to select worker and provide an appointment letter
- **4.2**: One year (240 days in 12 months, including public and weekly holidays) probation, permanent appoint letter, inform to Labour Officer
- **4A.1**: No non-Nepalese to be hired, unless skilled technicians not available even after advertising
- **5**: Minor/female: 6 AM-6PM OK; females same as male with mutual consent
- **7**: Contract: only in non-permanent type of work
- **10**: Firing only by following procedure; **15**: compulsory retirement at 55 age, may extend 5 years

Chapter 3: Working Hours

- **18**: 8 hours/day; 48 hours/week, one day holiday/week; Max. 5 hr shift, including ½ hr tiffin break
- **19**: Overtime at 1.5 times rate; no compulsory overtime; max. OT: 4 hrs/day. 20 hrs/week

Chapter 4: Remuneration

- **21**: Agreement below minimum remuneration rate not allowed; **21A**: Grade: ½ day wage
- **25.3**: 3 times penalty for undue deduction in remuneration
- **25.4**: Max. Rs. 1000 penalty if petition filed with malicious intent

4.2 Labor Law, 2048 (1992)

Chapter 5: Health and Safety:

- **27**: Work area to be clean, supply of fresh air, light and proper temperature;
- proper solid waste and noise management,
- prevention of accumulation of dust, fume, vapour;
- no congestion: minimum 15 m^3/worker, maximum 4 m height
- Adequate drinking and cleaning/washing water, fire extinguishing
- Separate toilet for male and female; No-smoking zone
- Compulsory health check once a year for hazardous works
- **28**: protection of eyes; **29**: personal protective devices against chemical hazard;
- **30**: safety against fire; fire exit; fire-fighting devices; **31**: Hazardous area to be fenced

Chapter 6: Welfare provisions

- **37**: establishment of a welfare fund; **38**: compensation for injury or death
- **39**: Gratuity, provident fund, Medical expenses; **40**: Leave
- **41**: Provision of quarter; **42**: If 50 or more female workers: provision of children's room, trained nurse, toys, time for female workers to feed suckling babies
- If 50 or more workers: **43**: relaxing room; **44**: canteen

Chapter 7: Special provisions for special enterprise

- **46**: Construction business

Chapter 8: Conduct and Punishment

Chapter 10: Settlement of legal disputes

4.3 Contract Law, 2056 (2000)

- No. of Chapters: 13, No. of Sections: 90
- **Chapter 1:**
- (a) Contract: an agreement enforceable by law concluded between two or more parties for performing or not performing any work.
- (b) Proposal: a proposal presented by one person to another with the intent of obtaining his/her consent to do or not to do any work.
- (c) Consent: the consent given by the person to whom a proposal has been presented in the same meaning of that offer.
- (d) Consideration: the promise made to do or not to do any work in return of doing or not doing of any work mentioned in the proposal.
- **Chapter 2:** Contracting Parties, Proposal and Consent
- **3**: Person competent to conclude contracts
- 16 years and sane; guardian may contract on behalf of incompetent

- **Chapter 3:** Void and Voidable Contracts
- **13**: Void Contract
- **14**: Voidable Contract
- **Chapter 5:**
- **Chapter 6:** Contract relating to Collateral and Deposit
- **Chapter 7:** Contract relating to Sale of Goods
- **Chapter 8:** Contract relating to Agency
- **Chapter 11:** Execution of Contract and Obligation Arising out of the Contract
- **79**. **Contracts need not executed in the event of fundamental changes in the situation**
- **Chapter 12:** Breach of Contract and Remedies

4.3 Essentials of a valid contract

- **Offer and acceptance**: An offer is a promise made by a party/person to another party/person with an intention of getting approval over his/her promise. A tender submitted by a contractor is considered as offer. The client, after due consideration and evaluation of the offer, provides acceptance of the offer.
- **Mutual intent to enter into contract**: An agreement between two (or more) parties is not automatically a contract. A contract requires the parties intention to establish a legal relationship. The parties' intention of entering into contract should be clearly reflected in the agreement.
- **Consideration**: All the concerned parties of the contract should get something of value for fulfilling the terms and conditions of the contract.
- **Capacity to contract**: A party (or person) entering into a contract should be of legal age and should be under his/her own control.
- **Lawful purpose**: The objective of a contract must be lawful to be valid.
- **Free consent**: The parties in a contract should have consented freely to enter into the contract. A contract signed under coercion, undue influence, fraud, misrepresentation etc. are invalid.

4.3 Void contracts (Section 13)

4.3.1 Void Contracts:

a) preventing anyone from engaging in any legal occupation, profession or trade.
b) restraining legal marriages.
c) preventing any one from enjoying public facilities.
d) seeking to prevent the legal rights of any person from being enforced by any government office or court.
e) concluded in matters, contrary to/prohibited by prevailing laws.
f) concluded for immoral purpose/against public morality or public interest.
g) which cannot be performed because the parties thereto do not exactly know about the matter in relation to which it has been concluded.
h) which is considered impossible to fulfill even at the time the contract is concluded.
i) which is vague (does not provide reasonable meaning thereof).
j) concluded by an incompetent person.
k) concluded with an unlawful consideration or objective.

4.3.2 Voidable Contracts (Section 14)

A contract concluded through:

a) coercion: threatens to withhold property, threatens defamation, takes actions against law
b) undue influence: influence exercised by a person upon another who is under his/her influence, like a ward/ subordinate/sick
c) fraud: knowingly leads the other party to believe untrue issue to be true, withholds or suppresses information
d) deceit: Submission of false particulars, falsifying document

The burden of proof rests on the claimant.

4.4 Cyber Law

- Cyber law provides the legal basis related to the appropriate use of computer and information and communication technology by a person, organization and the government offices.
  - It regulates the computer and other electronic equipment based activities including business (e-commerce) and the government (e-government).
  - Nepal has enacted the **Electronic Transaction Act** 2063 and Electronic Transactions Rule, 2064.

Electronic Transaction Act, 2063 (2006)

- To make legal provisions for authentication and regularization of the recognition, validity, integrity and reliability of generation, production, processing, storage, communication and transmission system of electronic records.
- For controlling the unauthorized access of electronic records (violation of the confidentiality) or of making alteration in such records through the illegal manner (violation of the integrity)
- No. of Chapters: 12, No. of Sections: 80, 31 definitions
- **Section 2: Definitions:**
- **2-a**: "Asymmetric Crypto System“: a system that creates a secured key-pair consisting of a private key creating a digital signature and a public key to verify the digital signature.
- **2-j**: “Key Pair“: a private key in an asymmetric crypto system and of pair of public key, interconnected in a mathematics form with the private key which has a code to verify digital signature by the public key to be created from the private key.
- **2-o**: "Digital Signature“: a signature made in any electronic form to be included in the transformation of electronic record by a person having a non- transformed initial electronic record and the public key of signatory by using a type of asymmetric crypto system that may clearly ascertain the following matters:
(1) Whether or not transformation of electronic record was created by using a type of private key keeping a logical consistency with the public key of signatory; and
(2) Whether or not the initial electronic record has been changed after the transformation of electronic record.

ETA 2063 continued

- **Chapter 2: Provisions Relating to Electronic Record and Digital Signature**
  3. Authenticity of Electronic Record: (1) Any subscriber may, subject to the provisions of this section, authenticate to any electronic record by his/her personal digital signature.
  (2) While authenticating the electronic record pursuant to Subsection (1), an act of transforming such electronic record to other electronic record shall be effected by the use of asymmetric crypto system and hash function
  4. Legal Recognition of Electronic Record
  5. Legal Recognition of Digital Signature
  Chapter 8: Provisions Relating to Network Service
- **Chapter 9: Offence Relating To Computer (Cyber Crime)**
  - **44.** To Pirate, Destroy or Alter computer source code
    45. Unauthorized Access in Computer Materials
    46. Damage to any Computer and Information System
    47. Publication of illegal materials in electronic form
    48. Confidentiality to Divulge
    49. To inform False statement
    50. Submission or Display of False License or Certificates
    51. Non-submission of Prescribed Statements or Documents
    52. To commit computer fraud
- **Chapter 10: Provisions Relating to Information Technology Tribunal**
- **Chapter 11: Provisions Relating to Information Technology Appellate Tribunal**

4.5 Public Procurement Act, 2063

- **Systematic, fair, transparent and optimum use of public resources in procurement of goods and services by public entities**
- **No. of Chapters: 10; No. of Sections: 76**
- **2-a**: "Procurement": acquisition of any goods, consultancy services or other services or carrying out or causing to be carried out any construction works, by a public entity pursuant to this Act.
- **3**: All procurement by any public entity should follow this act, else the procurement will be invalid.
  Chapter 2: Responsibility for Procurement and Procurement Method
- **4:** Description of Goods, Construction Works and Services to be Prepared
- **5:** Cost Estimate to be Prepared
- **6**: Procurement Plan to be Prepared
- **8**: Procurement Method to be Selected

- **Chapter 3:** Bid
- **12:** Prequalification to be Determined
  13: Bidding Documents to be Prepared
  14: Invitation to Bids

- **Chapter 4:** Consultancy Services
- **30:** Short List to be Prepared by Soliciting Expression of Interest Openly:
  31 & 32: Soliciting and opening proposals
- **33**: Evaluation of Technical Proposal
- **34 & 35**: opening and evaluation of Financial Proposal

4.5 Public Procurement Act

- Chapter 5: **Other Provision Relating to Procurement**
- **40 & 41**: provisions related to sealed quotation and direct procurement
  Chapter 6: Provision Relating to Review of Procurement Proceedings or Decision
  Chapter 7: Provision Relating to Procurement contract
- **54:** Variation Order
  55: Price Adjustment in Procurement Contract
  56: Provision Concerning Extension of Contract Period
  58: Mechanism for Dispute Settlement
  60: Public Notice of Procurement Contract:

  Chapter 8: **Provision Relating to Conduct**
- **61 & 62**: Conduct of official and bidder
  Chapter 9: **Provision Relating to Monitoring of Procurement Activities**
- Chapter 10: Miscellaneous
  - **66:** Provision Concerning Procurement to be Made in Special Circumstances
  - **67:** Procurement Process under this Act not to be Applied
  - **68:** All records are to be in written form
  - **69:** Procurement Transaction May be Carried Out Through Electronic Communications Means
  - **70:** Legal Documents to be kept in Website

4.6 Intellectual property right (patent, design and trademark, copyright)

The creations of human mind are considered as intellectual property. It covers patents, designs, trademarks and copy right; the legal rights given to the creators of such properties are called intellectual property rights. The World Intellectual Property Organization has listed the following as intellectual property.

- Literary, artistic and scientific works
- Performances of performing artists, phonograms, and broadcasts
- Inventions in all fields of human endeavor
- Scientific discoveries
- Industrial designs
- Trademarks, service marks, and commercial names and designations
- Protection against unfair competition, and
- All other rights resulting from intellectual activities in industrial, scientific, literary or artistic fields

The laws related to intellectual property rights in Nepal are:

(a) Patent, Design and Trademark Act 2022 (1965), amended in 1987 and

(b) Copyright Act 2059 (2002).

Patent

- **Patent:** As per the PDT Act 2022, the patent can be issued to any useful invention based on new principle or formula, or any new way or method of construction, operation or transmission related to substance or a body of substance.

- A patent should be duly registered, by submitting all the required documents, to have the patent right. Once registered, the right over the patent is protected for 7 years (plus two extensions, each of 7 years). The patent right is transferrable. The registered patent should not be used or copied without obtaining specific written permission from the patent holder, until the patent duration expires, within the jurisdiction of the patent provider. The law breaker can be fined up to Rs. 500000 and confiscation of the related items, and up to Rs. 250000 for committing an attempt of an offence.

A patent right cannot be granted if:

- The patent is already registered in another person's name
- The patent was not invented by the applicant and the right to patent has also not been received from the inventor
- The patent is likely to produce adverse effects on health, conduct and morality of the citizen or on national interest
- The patent is against the existing law

Design

- **Design:** The PDT Act 2022 has defined design as a feature, pattern or shape of a substance made by following any means.
- The design should be registered to have design right. A registered design should be used by someone else only with specific written permission of the design right holder, until the design right duration expires (5 years plus two extensions, each of 5 years).

The breach of the design right constitutes a fine of up to Rs. 50000 and confiscation of the related items.

The design right cannot be issued if

(a) the design was already registered by someone else, and

(b) the design is likely to have adverse impact on the conduct or morality of a person or institution or on national interest.

(c) The patent is against the existing law

Trademark

Trademark: The PDT Act 2022 has defined trademark as the use of any word, sign or picture or a combination of them by a firm, company or person to distinguish the product or services from those of others.

The trademark should be registered to have trademark right. A registered trademark, or its close imitation, should not be used by someone else. The right over a trademark can be protected forever subject to renewal (7 years in each renewal).

The trademark will not be registered if

(a) the trademark has already been registered by someone else and

(b) the registration will have adverse impact on the conduct or morality of a person or institution or on national interest.

The breach of the trademark right constitutes a fine of up to Rs. 100000 and confiscation of the related items.

Copyright

As per the Copy Right Act 2059, the copy right can be provided to the author of the works that are related to the following.

- Book, pamphlet, article, and research paper
- Drama, opera, dumb-show and similar works prepared for show
- Musical works with or without words
- Audiovisual works
- Architectural design
- Painting, sculpture, wood carving, lithography and architecture related other works
- Photographic works
- Works related to applied art
- Excerpt, maps, plan, three dimensional works related to geography, topography, and scientific writing and articles
- Computer program

- The description or the explanations of the ideas, religion, news, concept, formula, law, court decisions, administrative decisions, folk songs, folk stories, proverbs & general statistics, even if they are included in any works, cannot be copy righted.
- Specific registration is not required to have copy right.
- There are two types of rights granted under the Copy Right Act: Economic and Moral. Moreover, the Act has granted rights to performers, producers of phonograms and to broadcasting institutions. The copy right is effective up to 50 years after the death of the author (or creator) of the copy righted materials.

The copy righted materials can be used without permission in the following circumstances.

a) A portion of the work for personal use, as long as it does not hamper the economic right of the copy right holder.

b) For public cause or academic purpose, portion of a published materials may be used with proper citation of the source, provided that the use does not directly benefit (economically) the user of the copy righted materials.

c) Libraries and archives can reproduce the works for general purpose.

- Depending on the degree of infringement of the copy righted material, the penalty can range from Rs. 10,000 to Rs. 100000 or imprisonment up to six months or both for the first offense. The penalty doubles for the second offense. Besides, the offender shall be liable for compensation of the damages caused by his/her act.

Copy Right, Patent, Design and Trademark Comparison

SN	Particular	Copy Right	Patent	Design	Trademark
1	Subject Matter/ Coverage	Rights related to work authorship/ literary work, artistic work: music, book, movies, painting, photos	Rights related to new inventions/theory/ principles, process, formula	Rights related to shape, pattern, color of commodities, product	Rights related to word, symbol, picture, figure or combination of all these to recognize goods or products
2	Validity	a) Life time + 50 years b) 50 years from death of last surviving author c) For anonymous or pseudonym work: 50 years from first date of publication d) For applied art & photograph: 25 years from preparation of such work e) 50 years for posthumous publication	7 years and two times renewable (21 years maximum)	5 years and two times renewable (15 years maximum)	7 years and indefinite period as long as timely renewed
3	Infringement	Person other than owner comes up with same work, there is no infringement; can be copied and used without permission for academic, public welfare purpose, with source cited	Confers statutory monopoly that prevents anyone other than patent holder from making, using or selling	Confers statutory monopoly that prevents anyone other than design holder from making, using or selling	Confers statutory monopoly that prevents anyone other than trademark holder from making, using or selling
4	Punishment on infringement	a) 10,000 to 100,000 or 6 months imprisonment, or both + confiscation b) 20,000 to 200,000 or one year imprisonment or both + confiscation	Rs. 250,000 to 500,000 + confiscation of product	Up to R. 50,000 + confiscation of product	Up to Rs. 100,000 + confiscation of product
5	Start of protection	As soon as work is created (registration is optional)	From patent application registration date	From design application registration date	From trademark application registration date
6	Requirement	Original	Novel/non-obvious, useful	New and different	New and different
7	Application, registration and renew fee		Rs. 100; 1000; 300	Rs. 100; 700; 200	Rs. 100; 400; 150
8	Governing Act	Copy Right Act 2059	PDTA 2022	PDTA 2022	PDTA 2022

4.7 Company Registration Procedures

- Application with following documents:
  - Filled application form, format as per Annex 1
  - Two copies of Prabandha Patra (Article of Association), and Niyamawali (Article of Memorandum)
  - Citizenship certificates of all the founder shareholders
  - In case of a public company, a copy of the agreement made among the founder members before the establishment of the company.
  - In case of a private company, a copy of the mutual agreement (if any).

  (Additional documents needed for foreigner registering a company.)

  Other considerations:
  - Max 101 founders in private company; minimum 7 founders in public company
  - Prabandha Patra and Niyamawali to be in Nepali
  - Each founder should sign on each page of Prabandha Patra and Niyamawali
  - Last page should have
    - full name, full signature, address, number of share of each founder,
    - full name, full signature, address of witness (one witness per founder)
    - full name, full signature, registration number of legal-professional or chartered accountant preparing the document, and date of document preparation

- The OCR checks the documents and if found OK, notifies the applicant(s) to pay registration fee and collect certificate. If the Registered Capital is up to Rs. 5000, the charge can be paid at the OCR; else required fee to be deposited in NRB or other authorized banks in 'RAJASWA' account number1-1-05-10. Two copies of the voucher to be submitted in the OCR's A/C section, and then presented in the registration section. After this, the company registration certificate (according to the index 5) and one copy of each (approved and signed by CRO Officer) of the 'PRABHANDA PATRA' and the 'NIYAMAWALI' presented by the founders are provided to the founders.
- Only electronic registration, from Baisakh 2074, as per first amendment in 2074

http://www.ocr.gov.np/index.php/en/component/content/category/87-registration-process-information

4.8 Relationship to foreign firms working in Nepal

- Hundreds of foreign firms are working in Nepal, directly or indirectly, as INGO, banks, industry, management consultants, engineers in consulting companies, software, outsourcing, …
- Directly related acts: Foreign Investments and Technology Transfer Act,1992; Foreign Exchange (Regulation) Act,1963; Immigration Act
- Foreign Investment and One Window Policy
- Foreign Investment Policy, 2015 aims to:
  - Attract foreign investment in energy efficient/non-polluting industries by granting additional facilities.
  - Establish SEZ or export promotion zones.
  - Promote Nepalese products in int'l market and protect intellectual property of such products.
  - Transfer of technology within a specified period of time.
  - Develop legal basis for technology transfer in industries where foreign investment is restricted.
  - Include supply of equipment under the 'lease financing' model, investment in bonds and debentures, and investment through secondary market within the purview of foreign investment.
  - Technology transfer via – assignment, user's licensing, sharing of technical know-how and franchising.
  - Institutional investors to invest through the secondary market (portfolio investment).
  - Form Foreign Investment Promotion Board to facilitate establishment of foreign investment based industries
  - Form SOP to simplify the process of foreign investment.
  - Limit customs tariff on machinery imported for foreign investment in kind to 4%.
  - Avoid double taxation with additional countries.
  - Rights to use immovable property in relation to HEP and infrastructure projects under the BOT model remain with the investor for the duration of the related BOT agreement.
  - Facilitate repatriation of amount remaining after liquidation of the company by the foreign investor.
  - Enable parties to determine the mode and venue of dispute resolution procedure in case of industries having over USD10 million as investment.

Foreign Investment under the law of Nepal

1. Foreign Investment: Investment made by a foreign investor in any industry in form of:
   a) investment in equity,
   b) reinvestment of earning derived from existing investment,
   c) investment made in form of loan or loan facilities
   d) transfer of technology,
   e) lease finance,
   f) opening a branch to carry out business.
2. Transfer of technology: transfer of technology under an agreement between foreign investor and an industry on the following matters:
   a. use of any intellectual property rights of foreign origin,
   b. acquiring any foreign technical consultancy and management,
   c. acquiring foreign market service.
3. Foreign Investor:

   individual, firm, company, foreign government or international agency

Rights, Guarantees and security of FDI

- Fair and equitable treatment: No discriminatory treatment in all time,
- Most-favoured nation treatment: transfer of funds, incorporation of a company, FDI approval etc.
- National treatment: management, operation, protection, incentives etc.,
- Guarantee against expropriation: no nationalization, (Industrial Enterprises Act,sec.21)
- Nepal is a party to MIGA that protects political risks of FDI,
- An industry established under FDI in Nepal is entitled to the incentives awarded to other industries, (FITTA,sec.2(a),
- Guarantee for repatriation of FDI, (sec.5(2) FITTA)
- Nepal is a party to BITs/BIPPAs concluded with some countries that protects FDI of the country concerned.

Resolution of investment disputes involving foreign forms

- Investment disputes are contractual matters under Nepal law,
- Disputes between a foreign investor and Nepali investor or concerned industry shall be settled by mutual consultation in the presence of DOI, (sec.7,FITTA)
- If disputes could not be settled in that manner it shall be settled by arbitration under UNCITRAL Arbitration Rules, (sec.7(2) FITTA)
- Disputes in regard to foreign investment exceeding NRs.5oo million, may be settled by any manner as the parties design,(Parties are free to decide the manner for dispute resolution), (sec.7(4),FITTA)
- Nepal is a party to New york Convention on Recognition and Enforcement of Foreign Arbitral Award(1958),
- Arbitration Act,1999 is based on Model UNCITRAL Commercial Arbitration Act (1985)
- Nepal is also a party to the International Centre for Settlement of Investment Disputes (ICSID) Convention (1969)

Potential Questions

- How does Nepal Engineering Council regulate professional engineering practices in Nepal?
- Discuss the process of registration of an engineer at NEC and conditions for cancellation of registration.
- What are the employment and job security provisions for the workers, as per the Labor Act of Nepal?
- What are the health and safety provisions for the workers, as per the Labor Act of Nepal?
- What are the welfare provisions for the workers, as per the Labor Act of Nepal?
- Discuss the essential elements of a valid contract.
- What are the differences between a void and a voidable contract?
- What are the basic objectives of the Electronic Transaction Act of Nepal?
- What type of activities are considered to be an offence of the Electronic Transaction Act of Nepal?
- What is the basic objective of the Public Procurement Act of Nepal?
- What are the basic provisions in procurement of consultancy services by a public entity in Nepal?
- Discuss the importance of the intellectual property right in the development of science and technology of a society.
- Compare and contrast copy right, patent right, design right and trademark right, as per the laws of Nepal.
- Discuss the process of a private company registration in Nepal, including the types of documents required.
- What are the objectives of Foreign Investment Policy 2015 of Nepal?
- What are the rights, guarantees and securities provided to FDI in Nepal?
- What is the reason for the Nepalese government trying to attract foreign direct investment in Nepal?

Professional Ethics in Engineering

Contemporary and Emerging Issues in Engineering (6 hours)

5.0 Contemporary and Emerging Issues in Engineering
5.1 Globalization and cross cultural issues
5.2 WTO perspectives
5.3 Public Private Partnership (PPP)
5.4 Development versus Environmental Degradation
5.5 Addressing the Climate Change issues
5.6 Conflicts and Dispute management

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August 2017

Update: August 12. 2017

5.0 Contemporary and Emerging Issues in Engineering

- Efficiency in resource use (energy, human resource, bio-physical resource)
- Safety (public, workers, users)
- Environmentally and Socially justified development
- Benefit Sharing and protection of private property right
- Corporate Social Responsibility
- Gender and cultural aspects
- Child Right, Labor Right, Fair trade
- Accountability in Engineering
- Sustainability
- Reduce, reuse, recycle: zero waste
- Climate Change
- Output and outcome; technical auditing, energy auditing
- Transparency
- E-governance, instant access to public information
- Privacy of private information
- Community involvement in project design
- Automation of operation, monitoring and production process
- Robotics and mechatronics
- No trade barrier; WTO provisions
- Genetic and Medical Engineering: balance between technology and moral value
- Social Engineering
- Development in transportation and ICT: Globalization

5.1 Globalization and cross cultural issues

- Rapid development in transportation and ICT: Globalization – transfer of goods and services and movement of human beings across the world at rapid rate, and impact of an incident in one corner of the globe felt across the globe
- Need for understanding cross cultural values increase due to globalization
- Knowing when to listen, when to ask for help, and when—finally—to speak
- Developing effective relationship with people from cultures substantially different from ours.
- Individualism versus collectivism.
- Acceptance of power and authority.
- Materialism versus concern for others.
- Formality versus informality.

5.2 WTO Perspectives

- World Trade Organization (WTO) is a worldwide organization for maintaining trade relation among different countries. WTO officially commenced on 1/1/1995. Nepal got WTO membership on 11/1/2061 B.S. WTO helps in setting trade disputes among countries and creates a healthy environment for global trading.
- WTO deals with regulation of trade among member countries by providing a framework for negotiating and formalizing trade agreements and dispute resolution. It determines the Terms of Trade, International Policies, and Rules for Global Trade.
- WTO promotes world trade. It works for the implementation and operation of the various agreements made among different countries. It monitors and suggests improvements in the trade policies and rules of the member countries. It conducts programs for the livelihood upliftment and ensuring employment opportunities in member countries.
- WTO facilitates in enhancement of productivity and income level of the ordinary people including food security in the countries.

5.2 WTO perspectives

Opportunities for WTO membership:

- Government will become more rational in decision-making
- Rent seeking activities will decrease
- Problem of transit will be less
- Provisions of technical support
- Access to markets, duty-free-quota-free access among member countries

Benefits of WTO in Nepal: (a) Market access opportunities, (b) Policy stability, (c) Attract foreign direct investment, (d) Gearing up domestic institutional capability, (e) Benefits of positive discrimination and (f) Establishment of trade and transit rights

WTO challenges for developing countries

- Improving national policies
- Amending some laws and developing new laws
- Changing trade administration attitude
- Human resource development and infrastructure development
- Quality control of goods and services

5.2 WTO perspectives

Major Commitments Made by Nepal during Accession

	Measures	Initial Offer	Final Offer	Deadline
1	Agricultural tariffs	Average 51%	Average 42%	31/12/2006
2	Industrial tariffs	Average 39%	Average 24% *	31/12/2013
3	Liberalization of services sector			31/12/2009
4	Full implementation of TRIPS Agreement			31/12/2006
5	Full implementation of SPS Agreement			31/12/2006
6	Full implementation of TBT Agreement			31/12/2006
7	Full implementation of Customs Valuation Agreement			31/12/2006
8	Not to introduce export subsidy on agriculture			Accession date
9	Not to impose new Trade Related Investment Measures (TRIMS)			Accession date
10	Zero tariff on information technology products			31/12/2008
11	Complete phasing out of Other duties and charges (ODCs)			31/12/2013

* Includes categorical commitment to reduce tariff peak on motor vehicle from 130 per cent at present to 40 per cent at the end of implementation period, implying an annual reduction of 9 per cent. Source: WTO (2003) .

5.3 Public Private Partnership (PPP)

- **Definition**: Funded and operated through a partnership of government and one or more private sector companies
- Private party provides a public service or project
- **Assumption**: substantial financial, technical and operational risk in the project
- Enable public sector to harness expertise and experience
- **Fundamental principle of PPP**: Public service provision can be linked with profit making business, which makes the operation of the public service provision sustainable and efficient. Public gets the service at lower price due to risk sharing, business gets profit, efficiency increases, government can invest tax in other areas rather than in inefficient projects.
- **Conditions for successful implementation of PPP:**
  - Government's willingness, confidence & institutional capacity to adopt PPP
  - Clear policy and clear legal provisions (acts, laws, rules, regulations)
  - Society ready to accept reasonable profit as a justified
  - Fair and transparent business environment
  - Technical, financial and management capacity of private parties
- **Status of PPP policies and programs in Nepal**
  - White paper on PPP, PPP Policy
- **Reasons for low level of PPP implementation in Nepal**

5.4 Development versus Environmental Degradation

- Infrastructure construction and economic growth are not synonymous with development.
- Development activities need to be sustainable.
- Development which results in environmental degradation is unsustainable, and generates conflict.
- Development without environmental degradation is possible.
- Guidelines for project designs by considering environment prepared
- Many government agencies now has environment section
- Globalization, food security policy, energy and climate change and sustainable economic integration concepts are needed for development with environmental sustainability
- Frontier thinking in sustainable development and human well-being needed
- Ecological health and the positive relation between social and economic wellbeing is maintained.

- The Environment Protection Act 2053 (Clause 7): nobody shall create pollution in such manner as to cause significant adverse impacts on the environment or likely to be hazardous to public life and People's Health Protection Rules 2054 while practicing engineering profession.
- Two important examinations are to be carried out before initiating infrastructure projects: IEE and/or EIA
- **initial Environmental Examination (lEE)**
  – A report on analytical study or evaluation to be prepared to ascertain as to whether, in implementing a proposal, the proposal does have significant adverse impacts on the environment or not, whether such impacts could be avoided or mitigated by any means or not
- **Environmental Impact assessment (EIA)**
  – it is a report on detailed study and evaluation to be prepared to ascertain as to whether, in implementing a proposal does have significant adverse impact on the environment or not whether such impact could be avoided or mitigated by any means or not for construction of national high ways and main feeder roads.

5.5 Addressing the Climate Change issues

- **Climate Change (CC)**: sustained and gradual change in the nature of climate parameters, like temperature, rainfall, humidity, and wind speed
- **Science of CC**: natural and anthropogenic; increase in green-house gas release traps terrestrial radiation from escaping, resulting in rise in temperature, which affects global circulation of air, and changes timing and intensity of rainfall.
- **Effects of CC**: rise in average and maximum air temperature, rise in night time temperature, increase in intensity of rainfall, decrease in number of rainfall days, increase in number of days with rainfall more than 100 mm, rise in devastating flood and landslide events, Glacial Lake Outburst Flood, increase in frequency and intensity of drought, increase in river bed rise and sedimentation
- **Impact of CC**: agricultural fields washed, reduced agriculture production, damage to infrastructure due to flood and landslide, flash flood washing people, GLOF damaging riverside settlements, villages under landslide, desertification resulting in migration, increase in inundation and water borne diseases, tree line going uphill, insects appearing in higher elevation and spreading diseases
- **Role of Electronics and Electrical Engineers in CC mitigation**: increase in energy efficiency – generation and use (LED bulb, motion detecting light bulbs, satellite monitoring of forest fire, litigation support against exhaust, remote monitoring of climate data using data loggers and relaying information, smart grid design, decrease in energy loss in transmission, environmentally sensitive developments, …

5.6 Conflicts and Dispute management

- Conflict results when people have different (real or perceived) value or approach on particular issue(s).
- Organizational Conflict: *"Organizational Conflict is a state of discord caused by the actual or perceived opposition of needs, values and interests between people working together."*

Three approaches to organizational conflict

- **Traditional approach** (1930-40): Conflict is opposite of cooperation, and is inherently bad, negative and harmful for smooth functioning and progress of society, organization or a project. Conflict is equated to dysfunction and destructive, and must be avoided. It results from poor communication, disagreement, lack of trust, and low management skill.
- **Human Relations approach** (1950-70): Conflict is inevitable and can be beneficial, if managed properly. It is not inherently bad.
- **Inter-actionist approach**: Conflict makes an organization dynamic, and helps in finding best solution to problems. On-going manageable level of conflict should be encouraged as it prevents organization from being static. So conflict is good.

5.6.1 Levels and sources of conflict

Levels of Conflict

- Intrapersonal conflict: conflict within self due to differences in goal, role, and personal values
- Interpersonal conflict: between two or more persons; can be due to differences in goal, role, values, culture, communication gap
- Intergroup conflict: between two or more groups of people
- Inter-organizational conflict: between two or more organizations
- International conflict: between two or more nations

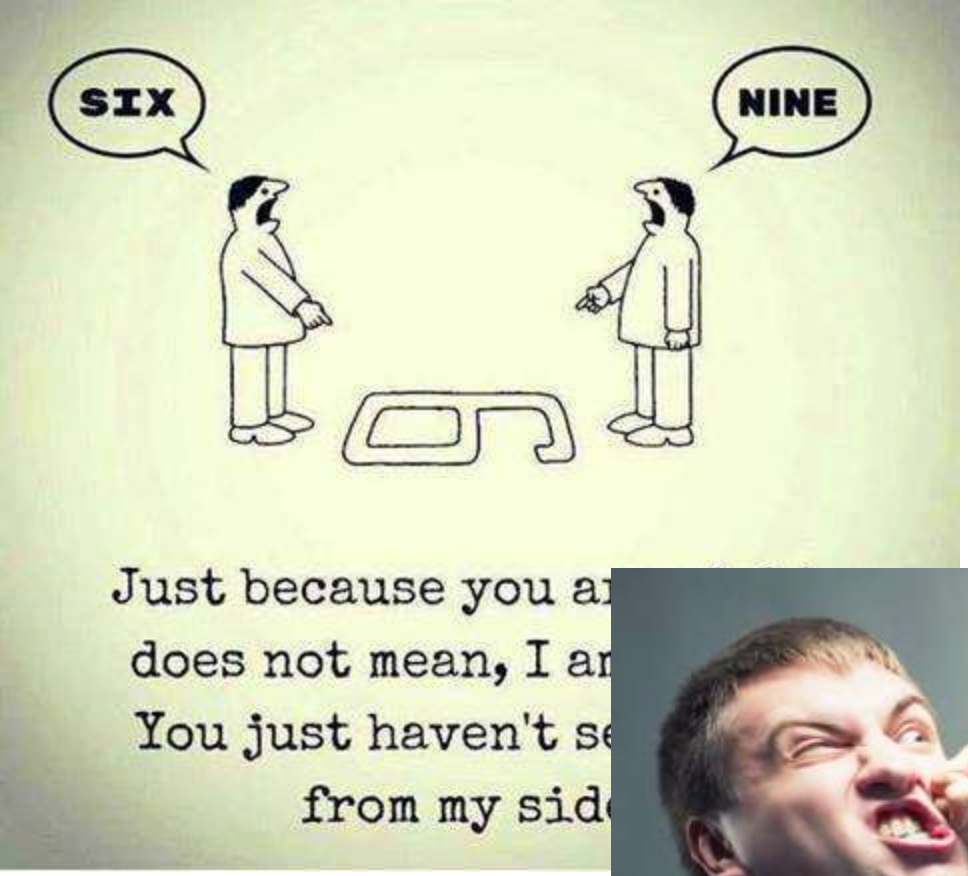
5.6.2 Levels and sources of conflict

Sources of Conflict in an organization (or a project)

- **Personal differences/Personality clash**: When the ideas, values, culture and customs of a person (or persons) are incompatible with other persons of an organization.
- **Goal and role incompatibility**: When the ideas, values, culture and customs of a person (or persons) are incompatible with the goal of an organization or assigned role of the person in the organization.
- **Organizational climate and change**: When the work environment and rules of an organization are unpredictable, and when the rules or managers or owner of the organization suddenly changes.
- **Gender and other social differences**: When the work environment and rules are designed to favor employees from a particular socio-cultural background or particular gender.
- **Availability and access to resources**: When the availability of resources becomes too limited and/or unevenly distributed. When access to resources is uneven.
- **Communication gap**: When there is communication gap between organization and its employees.

5.6.3 Conflict resolution methods: avoidance, diffusion, containment, confrontation

- **Avoidance:** avoid conflict, ignore conflict, “time will heal” approach; in this method the management will try to create a situation where conflict does not occur, for example by hiring workers from similar socio-cultural background. If conflict occurs, the management will wait for the situation to calm down, rather than taking any proactive situation.
- **Diffusion**: distraction and defuse into multiple sectors; bring in “other” issues so that the main reason from the conflict becomes less important or one of the many issues; bring in other stakeholders..
- **Containment**: conflict contained within certain people, and resolved through discussion and bargaining, in closed meetings, in the hope to resolving the conflict before it goes out of control or before it expands.
- **Confrontation**: conflict brought in front of all concerned, conflict resolution through open dialogue, face-to-face meeting, open bargaining, and resorting to legal process, if needed.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5.6.4 Dispute resolution methods: conciliation, mediation, adjudication, arbitration, and litigation

- **Conciliation**: Mutually agreed terms and conditions, "give and take" approach, without direct involvement of outsiders (mediator), even though the mediator assists in bringing the parties together.

- **Mediation**: similar to conciliation, but with direct involvement of outsiders (mediator). The mediator facilitates, and intervenes, if needed, in conflict resolution process (as per Mediation Act 2068).

- **Arbitration**: Resolution through certified licensed professional arbitrators, using the clauses of acts and regulations, after thoroughly investigating the issues of conflict. The arbitrators are normally selected, by mutual consent, from panel of experts.

- **Litigation**: Resolution through court, as per prevailing laws, acts, rules, regulations, and legal precedents of a country.

5.6.5 Dispute resolution methods: adjudication and arbitration as per PPA

Disputes are inevitable in construction projects and in engineering professional works. Dispute resolution procedures are normally mentioned in the conditions of contract. The Public Procurement Act 2063 (PPA 2063, Chapter 7, Section 58) and Public Procurement Rules 2064 (PPR 2064, Chapter 12) have provisions for dispute resolution.

If the parties in dispute cannot resolve the dispute through mutual consensus (amicable settlement), then, as per Section 129 of PPR 2064,

- For works of value up to Rs. 100 million, disputes can be settled by sole adjudicator (निर्णयकर्ता).
- For works of value above Rs. 100 million, disputes shall be settled by a Dispute Resolution Board (DRB) consisting of three members (one from private party, one from public entity and one agreeable to both, Clause 130-2).
- If the parties cannot settle dispute through adjudicator or DRB, then the dispute can be resolved through arbitration (मध्यस्थकर्ता) or litigation (court), PPR, Section 135.
- The adjudicator is a related technical expert with at least 5 years of experience.
- Remuneration of the adjudicator will be borne equally by the private party and public entity.

5.6.5a Dispute resolution methods: adjudication and arbitration

Adjudication:

- The adjudication is “a quick and relatively inexpensive way of resolving a dispute, whereby an impartial third party adjudicator decides the issues between the parties”.
- The following are the characteristics of adjudication.
  - It is a mechanism of dispute resolution.
  - An independent third party, called adjudicator, awards the decision
  - Quicker and inexpensive mechanism of dispute resolution, compared to arbitration and litigation, normally taking less than 30 days after submission all relevant documents.

- The Public Works Directive (PPD) and the Public Procurement Act (PPA 2063, Section 58) have provisions for dispute resolution through adjudication.

5.6.5b Dispute resolution methods: adjudication and arbitration

Arbitration

- The arbitration is a formal mechanism of dispute resolution conducted outside a court, as per Arbitration Act 1999. The following are the advantages of arbitration over litigation.
- It is a private alternative to formal court procedure: voluntary in nature
- The arbitrators are technical experts; can result in creative solutions
- Faster conclusion, within 120 days after submission of documents (Section 24)
- Less expensive
- No public hearing, so low publicity and less stress (which is normally preferred by the parties)
- Less confrontational and formal, hence more convenient to the parties of dispute
- Can appeal against decision in Appellate Court within 15 days (Section 21-2)

- The PPA 2063 has recognized arbitration as a means of dispute resolution. Arbitration Act 1999 (Section 17) governs the arbitration procedure in Nepal. The Nepal Arbitration Council 1991 has been providing arbitration services in Nepal. However, in Nepal, most of the disputes go to court, or settled out of court through mutual consent, even after arbitration, by ignoring the arbitrators' decisions.

5.6.6 Conflict versus Dispute

Conflict	Dispute
Long term serious disagreement, non-specific issues	Short term disagreement, over specific issued, can be resolved
Non-negotiable issues	Negotiable issues
Involves principle, values, ego, belief, interest	Involves amount, money
Conflict does not turn into dispute, unless intervened.	Disputes, if unsettled, can convert into conflict
Each side is fundamentally opposed to the success of the other and will not compromise their own values at the risk of allowing those they despise to achieve even the slightest victory (Burton, 1990)	specific disagreement concerning a matter of fact, law or policy in which a claim or assertion of one party is met with refusal, counter-claim or denial by another; Win-win scenario can be compromised.

Self Test

- Define conflict and explain the sources (causes) of conflict.
- Discuss different levels of conflict.
- Discuss different methods of conflict resolution.
- Differentiate between conflict and dispute.
- Discuss dispute resolution methods. Which method is better: adjudication or arbitration?
- What are the major differences between mediation and adjudication?
- Which method of conflict resolution is preferred by private parties, and why?
- What are the major sources of dispute in an infrastructure development related construction project in (a) a remote area of Nepal, and (b) in urban areas?
- Discuss the potential sources of conflict in (a) a high dam hydropower project, (b) fast tract highway, (c) broad gauge railway through mid-hills of Nepal, (d) international airport in Nijgadh, (e) multi-purpose water resources development project, (f) land pooling project for planned city development

Professional Ethics in Engineering

Case Studies Involving Professional Ethical Issues (4 hours)

6.0 Case Studies Involving Professional Ethical Issues
6.1 Copyrights and Patent Protection
6.2 Personal Data Privacy
6.3 Industrialization and Environmental protection
6.4 Risk/Benefit considerations in public transportation
6.5 Engineers and the military
6.6 Science and technology for medicine
6.7 Engineers in international development
6.8 Arbitration

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August 2017

Updated: August 12, 2017

6.1 Copyrights and Patent Protection

6.1.1 A fresh water resources engineering graduate (Engineer A) is approached by a Department of Groundwater (DoG) senior engineer. The DoG engineer asks Engineer A to conduct a district-wide study of groundwater-surface water inter-link in Palpa, and provides a sample of a report to be produced. Engineer A finds that the sample report is based on a superficial study, with all the data taken from USA, and requests money to visit Palpa and collect field data. The DoG engineer refuses, saying that they got the project from low bid, asks Engineer A to prepare the report based on assumed data and assures that Engineer A will not face problem since the contract to conduct the study was obtained by a consulting firm registered in DoG engineer's spouse's name, the DoG engineer himself is responsible to check the report quality, and Engineer A's name will not be in the report.

- List all the options for Engineer A.
- Separate the options into moral, ethical, and legal categories.
- Analyze each option based on ethics and risk to Engineer A.

6.1.1 List of options for Engineer A.

- Follow the suggestions of the DoG engineer (use data from textbooks to prepare report)
- Visit the site at Engineer A's own expense, and prepare good report based on field data.
- Collect and study previous reports of the same area which provides related data and prepare report based on secondary information.
- Refuse to be involved in the work and return the sample report to DoG Engineer.
- Accept the assignment, secretly record further conversations with the DoG engineer and report the case to CIAA, with proof.
- Publish an article in newspaper/magazine about the case, with the name of the DoG engineer.

6.1.2 Breach of intellectual property rights & copyrights

- **Weak IPR laws bane for foreign investment;** Published: March 14, 2017; by **PUSHPA RAJ ACHARYA**
- *Owing to trademark dispute with a local firm, Kansai Paint mulling over pulling out from Nepal*
- At a time when the government has been harping on foreign investment in a bid to advance Nepali economy, one of the reputed foreign joint ventures is mulling over retracting its investment from Nepal as a consequence of intellectual property rights (IPR) dispute with a local firm.
- A Japanese foreign investment in Nepal, Kansai Paint, which entered Nepal in 2012 in joint venture with Nepal's Shalimar Paints, has failed to obtain trademark from the Department of Industry (DoI). This is because capitalising on the weak intellectual property rights (IPR) laws in the country, a local investor had registered a firm under the name 'Kansai Nerolac Paint Nepal Pvt Ltd' at the Office of Company Registrar and had applied for trademark before the foreign joint venture.
- The local firm — Kansai Nerolac Paint Nepal Pvt Ltd, which is run by Goyal Group — is in no way related to the Kansai Paint.
- Since Nepal is a member of World Intellectual Property Organisation (WIPO), it is a pity that the country was unable to identify even a globally reputed brand like Kansai. The country may lose foreign investment worth Rs 350 million of the Kansai Paint, which entered the country through its Indian subsidiary Kansai Nerolac Paints India, as the DoI has scrapped the application of the foreign joint venture to obtain trademark of its own name.
- As per Pradip Koirala, director general of DoI, the authorised agency under the Ministry of Industry to enforce Patent, Design and Trademark Act, the department had scrapped the application of the foreign venture as per the provision of law that provides favourable treatment on 'first come, first served' basis. He, however, admitted that the laws need to be amended to lure foreign investment citing foreign firms are sensitive in regard to intellectual property rights.
- The globally renowned Kansai Paint had purchased 68 per cent stake of Nepal's Shalimar Paints through its Indian subsidiary Kansai Nerolac Paints India and registered a company Kansai Paints Nepal Pvt Ltd. However, the foreign joint venture had faced a court case from the local company — Kansai Nerolac Paints Nepal Pvt Ltd. The Supreme Court, some four months back, had issued a verdict in favour of the local firm citing that it had registered the company prior to the foreign joint venture.
- The local firm, which is producing paints under the brand of Nerolac and Kansai, again filed a case at the DoI and the DoI also scrapped the application of foreign joint venture and refused to issue the trademark it had sought. The foreign joint venture also faced unfavourable decision from the Patan High Court, where it had filed a case seeking protection of its trademark. As per the court's decision, the company has to change the name of its product because the local firm has already captured the brand of reputed Kansai Nerolac Paint in the Nepali market.
- Due to all these reasons, the foreign investors are now thinking about exiting from Nepal, according to sources. Nepali partners of the foreign joint venture have also backed this claim. "Kansai Paint, which came to Nepal through its Indian subsidiary after signing of bilateral investment promotion and protection agreement (BIPPA) with India during the premiership of former prime minister Baburam Bhattarai, has been left red-faced in Nepal," said Ashok Vaidya, who is a Nepali partner of the foreign joint venture.
- Kansai Paint, originally from Japan, has set up factories in 25 countries and is selling its product under its own name. Due to the country's weak IPR laws, this case will establish a false precedence among potential foreign investors in Nepal, according to Vaidya. "The country will not only lose foreign investment, there are chances it will also lose its reputation across the globe if the foreign investors withdraw investment from Nepal."
- The foreign joint venture Kansai has been providing direct employment to 100 individuals and contributing revenue worth Rs 500 million to the government every year. Kailash Chandra Goyal, who has been operating the local firm under the name of 'Kansai Nerolac Paint Nepal Pvt Ltd' and producing paints under the brand name of Nerolac and Kansai refused to comment on the matter.

6.2 Personal Data Privacy

- The US government asked the details of phone calls and emails of a seven persons it suspects as anti-nationals from a Europe based communication company, with a branch in the USA. The company refused, citing its policy of protecting personal privacy provision of its client, and requests to provide legal documents from US court for it to submit the data. The US government informed that the suspects are planning to conduct a major crime and needs the information immediately. However, the company was adamant, also cited European and US laws prohibiting disclosure of personal data without a court subpoena. A major criminal incident occurred two weeks later and one person died; the US government arrested several persons including all the seven whose communication details it sought; and accused the communication company of collusion in the crime. The court found only one of the seven persons guilty of the crime.
- A) Was it right for the US government to demand the personal data of all the persons it suspects of plotting a crime, without submitting subpoena?
- B) Was it right for the company to refuse to cooperate with the demands of a legitimate government?
- C) Do you agree that the company assisted the criminals by not providing the personal data to the US government?
- D) Should the company assume responsibility for the crime?
- E) Since one of the seven suspects was found to be involved in the crime, do you consider the demand of the US government to provide personal data of all the seven suspects justified?
- F) Do you consider the European and US laws prohibiting disclosure of private data to a legitimate government without a court subpoena needs to be amended?

G) Do you consider the company liable for the breach of the right to life of the person who died in the incident?

6.3 Industrialization and Environmental protection

The Environment Protection Act compliance monitoring team is about to visit a major electronics industry, which was accused of dumping its lead based hazardous materials in a dug well which contaminated the groundwater and posed health hazard to the local residents. The manager of the industry asked the MIS officer to change the data in its system to show that it is complying with all the existing laws of hazardous waste dump. The MIS officer refused, saying that the data is available in many locations within the system, someone else may have downloaded the data which may eventually get in the hands of the monitoring team, and that it is unethical to change the data. When the MIS officer was asked again to do the same act, he demanded the order in written form. The manager informed that the potential penalty of the breach of the law can severely damage the industry's financial condition and its image, and industry may be bankrupt. He promised that if the changes are made in the database and they are successful in averting penalty, the industry will install water treatment plant, provide the clean water to the local residents, and also install proper hazardous waste management system thereafter; this will be in the benefit of the industry, the local residents, and the industry's employees.

A) Do you consider the demand of the manager moral and ethical?

B) Was it OK for the MIS Officer to ask for the written order?

C) Since changing the data seems to benefit of all the parties, should the MIS Officer comply to the demand?

D) If the MIS Officer did not comply, and the industry went bankrupt, what is the degree of responsibility of the MIS Officer for the joblessness of the employees?

E) If you are the MIS Officer, what would you do in this condition, and why?

6.4 Risk/Benefit considerations in public transportation

- **USA**: In 2014, 32,675 people were killed in 29,989 crashes, an average of 96 per day. The number of deaths, and deaths relative to the total population, has declined over the last two decades. From 1979 to 2005, the number of deaths per year decreased 14.97% while the number of deaths *per capita* decreased by 35.46%. The 32,479 traffic fatalities in 2011 were the lowest in 62 years (1949).
- **Nepal**: According to Nepal Police records, 1,356 people died in road accidents in the fiscal 2008-09, 1,734 in 2009-10, 1,689 in 2010-11, 1,837 in 2011-12, 1,816 in 2012-13, 1,786 in 2013-14 and 2004 in 2014-15. At least 1,305 road fatalities were reported in the first 10 months of the current fiscal. On an average, 1,800 persons die in road accidents in Nepal every year. Police say road accidents are on the rise due to increased vehicular traffic. A fairly large number of accidents go unreported, because the parties involved settle the matter themselves. (August 4, 2017, THT)

Based on the information given above answer the questions.

- A) What is the trend of fatal road accidents in Nepal versus USA?
- B) Considering that the population of the USA is 330 Million, and vehicle ownership is 1 vehicle per 1.3 person, compare the numbers given above in terms of fatalities per million population and fatalities per number of vehicles; the total number of vehicles registered in Nepal, including motorbikes, is about 2 million.

C) As an electronics engineer, what role can you play in reducing risk of fatal road accidents in Nepal?

6.4 Risk/Benefit considerations in public transportation

- **The Public Transportation Entrepreneur Association (PTEA)** demanded 15% rate hike in bus fare when the diesel price went up by 10%. PTEA claimed that the risk and benefit associated with operation of public buses is linked with diesel price; as fuel price rise risk increase (higher investment for lower return) and benefit decrease (lower seat occupancy). So to compensate for rise in risk and drop in benefit, the bus fare needs to be raised by higher percentage.
- **The Government of Nepal (GoN)** did not agree with the PTEA logic. GoN said that the bus fare is based on fuel, vehicle maintenance, tyre wear and tear, lubricants and oils, driver and helper's wages, bank loan, and profit on investment. Since the price of only one of the parameters has increased, it is unfair and unethical to increase bus fare by more than 2%.
- GoN refused the PTEA demand saying that the diesel price is not linearly related with diesel price. The PTEA threatened to call a strike if their demands are unmet within 48 hours. Eventually a technical committee was formed to settle the dispute, and appointed you as the decision maker. Prepare your report which addresses all the issues raised by PTEA and GoN, electronic monitoring of seat occupancy, and a design to automatically revise bus fare in similar situations in the future so that the risk and benefit in operation of public transport is transparent.

6.5 Engineers and the military

- The Nepalese Army (NA) has already established a medical college and planning to run an engineering college. The NA is engaged in disaster Risk Management and construction of fast track highway and also planning to invest in hydropower sector in Nepal.
- (a) if you are an engineer working for the NA, what suggestion would you give to the decision makers for further expansion of the NA in other sectors where engineering services are needed?
- (b) if you are an engineer working in a private sector in hydropower development and/or highway sector, what is your suggestion/opinion on the gradual expansion of the NA in the sectors traditionally handled by the private sector engineering firms?

6.6 Science and technology for medicine

- An insurance company asked for the medical records of one of its clients, claiming that the patient has unreported a pre-existing condition, and hence ineligible for reimbursement of expenses. The hospital administrator asked you, the IT Officer, to provide the records. You asked the part-time doctor who checked the patient; the doctor refused to allow you to submit the report, citing patient confidentiality provision. The administrator then asked you to make a copy of the report and submit to him or reveal him the password of the hospital MIS system. The administrator also threatens to take disciplinary action against you if you did not act accordingly.
- A) What are your options in this situation? Which options are ethical and which ones are unethical?
- B) Is there any way to fulfil the administrator's demand without compromising patient confidentiality?
- C) As a professional engineer, what should you do in this situation?

6.6 Science and technology for medicine

- Many governments have banned stem cell research or erected obstructions in SC research.

Stem cell research thus raised difficult questions:
Does life begin at fertilization, in the womb, or at birth?
Is a human embryo equivalent to a human child?
Does a human embryo have any rights?
Might the destruction of a single embryo be justified if it provides a cure for a countless number of patients?
Since embryonic stem (ES) cells can grow indefinitely in a dish and can, in theory, still grow into a human being, is the embryo really destroyed? *http://learn.genetics.utah.edu/content/stemcells/scissues/*

- What are the roles of an electronics engineer in addressing these questions?

6.7 Engineers in international development

The MSc Engineering for International Development aims to expose engineers and built environment students and professionals to the challenges and complexities of working in a global context, and equip them with necessary skills and knowledge to place these in the frameworks and paradigms in which they might work. This programme will focus on the provision of sustainable and resilient infrastructure in low-middle income countries.

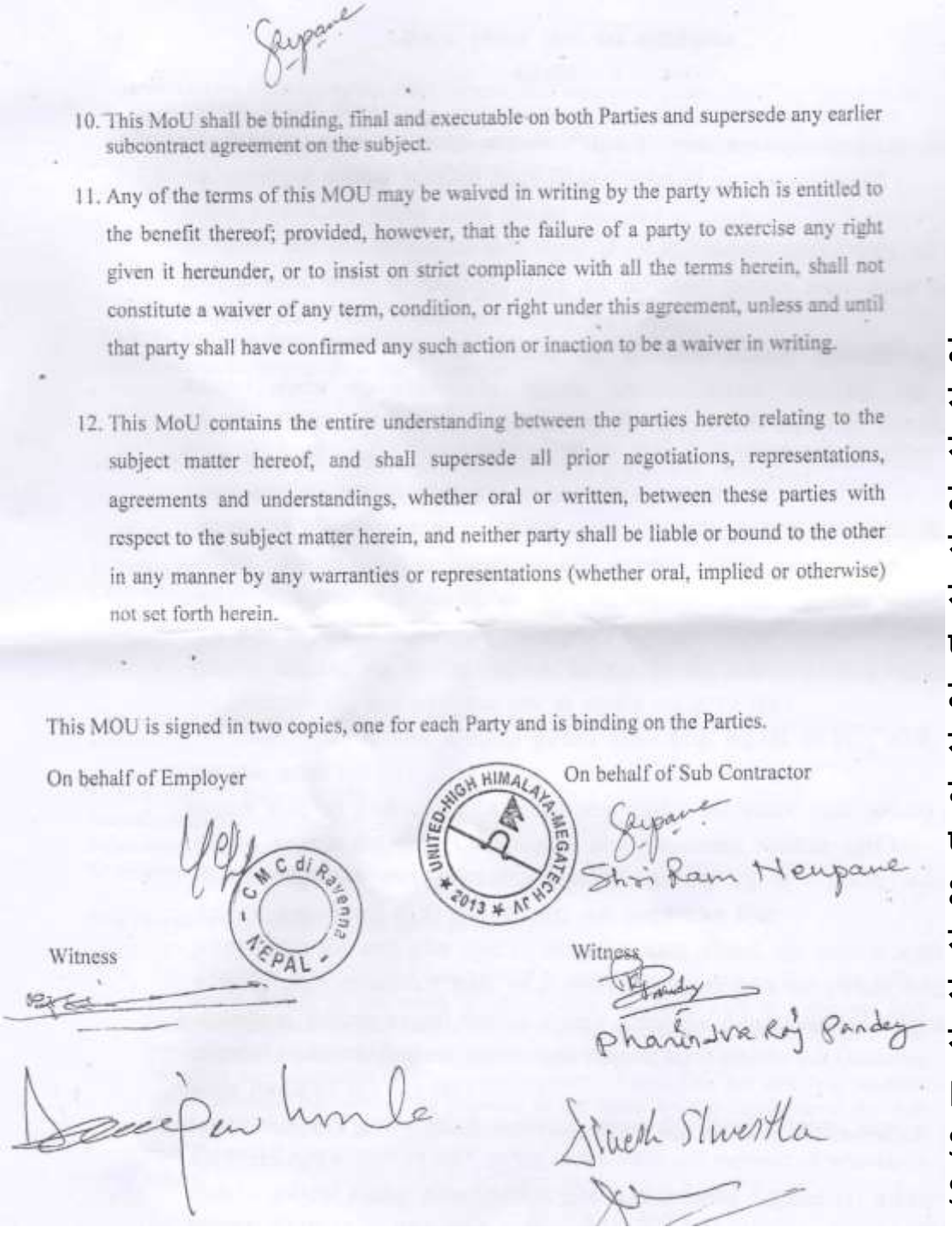
Engineers without Border
Policy Intervention
Sustainable, balanced, justified development
Site specific research for reliable design: bio-physical aspects
Access to the fruit the development: affordability
Energy – Water – Food Nexus
Culture and Disaster Sensitive Development
Conflict free development: local livelihood, benefit sharing

6.7 Engineers in international development

- You are assigned to design an integrated circuit / hydropower dam for a project in a country which is considered hostile to your country.
- A) Should you accept the assignment and do your best professional work for the project?
- B) Should you accept the assignment and secretly and deliberately introduce bug in the program, or introduce weak section so that the project will eventually fail and result in a disaster?

6.8 Arbitration

- The project you are involved in from the contractor's side is in dispute with the consultant and client. The client refused payment even after completion of work citing 30-days delay in work completion. The delay was due to initial 5-day strike by the contractor's workers, immediately followed by a 6-day national strike by a political party. The contractor claimed that it could have completed the work if there was no national strike, which resulted in the workers returning home and also resulted in unavailability of construction materials in time, and hence not responsible for the delay; the client cited workers' strike as the main cause of delay.
- Which method of dispute resolution would you prefer – arbitration or litigation?
- Prepare your logic for full payment claim.



10. This MoU shall be binding, final and executable on both Parties and supersede any earlier subcontract agreement on the subject.

11. Any of the terms of this MOU may be waived in writing by the party which is entitled to the benefit thereof; provided, however, that the failure of a party to exercise any right given it hereunder, or to insist on strict compliance with all the terms herein, shall not constitute a waiver of any term, condition, or right under this agreement, unless and until that party shall have confirmed any such action or inaction to be a waiver in writing.

12. This MoU contains the entire understanding between the parties hereto relating to the subject matter hereof, and shall supersede all prior negotiations, representations, agreements and understandings, whether oral or written, between these parties with respect to the subject matter herein, and neither party shall be liable or bound to the other in any manner by any warranties or representations (whether oral, implied or otherwise) not set forth herein.

This MOU is signed in two copies, one for each Party and is binding on the Parties.

On behalf of Employer

On behalf of Sub Contractor

Witness

Witness

Arbitration Committee formed in Melamchi Dispute: CMC vs. Megatech

मेलम्ची आयोजनाको मूल ठेकेदार र सहायक ठेकेदारबीच भुक्तानी बिबादलाई सल्टाउन पक्षहरूको अनुरोधमा खानेपानी मन्त्रालयका सहसचिव अनिलभद्र खनालको संयोजकत्वमा मूल ठेकेदार र सहायक ठेकेदारहरूका तर्फवाट १/१ जना प्रतिनिधि रहने गरी ३ सदस्यीय मध्यस्थकर्ता समिति गठनगर्ने आपसी सहमति भए बमोजिम हिजो एक समिति गठन गरिएको छ । यो कमिटीले पक्षहरूबीच आपसी सहमतिका आधारमा भुक्तानी बिबाद सल्टाउने सिफारिस गर्ने र सोही वमोजिम समस्या यथाशिघ्र समाधान हुने अपेक्षा सबै सरोकारवालाको रहेको छ ।

Facebook Post of Mr. Bhim Upadhyay, Secretary, Ministry of Water Supply and Sanitation, August 11, 2017

Some basic guidelines in analyzing case studies

- Read the question carefully, paying attention to adjectives.
- Analyze the case from ethical, moral, social, legal and professional angles, and assign role/responsibilities of each party involved in the case.
- Base your analysis, wherever appropriate, on professional code of conduct of NEC, NEA, FCAN, SCAEF, IEEE, CAN, or any other professional organization. Specifically mention code, if you can.
- Many cases involve conflict of interest (COI); if the case you are dealing with is related to COI, specifically mention it.
- If specific laws are applicable, perform legal analysis and mention the law, and specific sections/clause(s).
- Make your recommendations impartially, thinking of you as an impartial judge, considering existing social, technical, legal and professional codal provisions.

Sample Case studies (i): A client came to a designer and asked to design a multistoried building. The soil type of the proposed site was found not suitable for that type of structure. The designer hesitated to design the building. The client said that he actually was not going to build that structure. He wanted to collect money from outside sources showing that designed as a proposal for his venture and wanted to utilize that money in other business. Explain the roles of the client and the designer in the perspective of professional ethics.

Your answer should address the following issues.
Role of Client and Designer (a) Is the intention of the client legal? **(b)** Is the intention of the client moral? **(c)** Is the intention of the client ethical?

Morally, ethically, and legally, what should the designer do after knowing the real intention of the client?
Should the client be penalized for telling the "real intention" to the designer?
Should the designer refuse to design? If yes, why? If no, why?
Should the designer refuse to design and just keep quite?
Should the designer just submit a design and keep quite because what the client does with the design is none of the designer's business?
Should the designer design with piles (or other suitable foundation design) to make the structure suitable for the type of soil?
Since the client is not going to build the structure anyway which does not increase hazard from the building to anyone, what is wrong in just providing a design, as a hypothetical case?
Should the designer refuse to design and inform the government officials about the client's intention?
Should the designer refuse to design and inform the media, or write an article in the newspaper, about the intention of the client?
As long as the design is structurally sound, is the designer responsible (morally, ethically, legally) for what the client does with the design?

Sample Case studies (ii) A recently built simply supported RCC roof slab of a single storied poultry farm in Chitwan, collapsed and killed all the chickens in the farm. The farm owner blamed the labor contractor for the defective work. The contractor denied and accused the client for providing low quality and inadequate amount of steel bars for the roof slab. The farm owner then asked for compensation from the steel bar supplier (for inferior quality bars) and the consultant (for improper supervision during construction). The bar supplier defended herself by saying that the farm owner bought the cheapest bar from her which has no guarantee. The consultant reported that the cause of the roof collapse is the use of very dirty water in mixing the concrete, which was provided by the farm owner and used by the contractor despite objections from the consultant's site supervisor.

Analyze the situation carefully and decide which party (client, contractor, and consultant) is more responsible or less responsible for the roof collapse. Explain your decision with reference to the Code of Conduct of NEC and FCAN.

Things to notice before assigning degree of responsibility:

Client: (a) Did only labor contract with the contractor, supplied materials on her own, (b) Supplied low quality steel bars (thinks all steel bars are same), (c) Supplied inadequate quantity of steel bars (shows no faith in design details), (d) Supplied dirty water for concrete mixing, despite objections from consultant (thinks water quality unrelated to concrete quality)

Contractor: (a) Worked with low quality steel bars, knowingly. Thought that contractor is not responsible for material quality since it is only labor contract. (b) Tied inadequate numbers of steel bars (increased steel bar spacing), knowingly. Thought that contractor is not responsible for material quantity since it is only labor contract. (c) Used very dirty water to mix concrete, knowingly, despite objections from consultant.

Consultant: (a) Did not or could not stop client from supplying low quality steel bars, (b) Did not stop contractor from tying inadequate number of steel bars, (c) Did not or could not stop client and contractor from use of very dirty water to mix concrete, (d) Reported the problems only after roof collapse and client's compensation claim