Unit I

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Human Values

Review of Universal Human Values.

↳ Truth
- ⇒ does not depend upon will or wish of an individual.
- ⇒ independent of desires of interests of opinion.
- ⇒ much harder to sustain a lie then to maintain truth.
- ⇒ one lie leads to another ~~until~~ until complexity is unmanageable.

↳ Love
- ⇒ Unselfish care and concern for the well-being of others and the world at large.
- ⇒ personal or erotic love is common interpretation.
- ⇒ Different types of love (motherly, motherland, fatherly, friendship etc.)
- ⇒ The less selfish it is, the more it enriches life (your relation with the person).

↳ Peace ⇒ calmness of mind, body, soul is peace.
- ⇒ product of all positive values working together sufficiently.
- ⇒ peace is endangered or lost when there is no truth or love or injustice or conflict.
- ⇒ Not to be confused with lack of activity or mere physical quiet.
- ⇒ Control one's desires and limit them whenever necessary.

If you steal something & no one knows about it, is wrong conduct.

⇒ irrespective of the fact someone is seeing you or not.

Right conduct

⇒ Behaving in a good way with everyone and not letting down or demeaning a person irrespective of caste, colour, creed, gender, work profile.

⇒ We treat others the way we wish to be treated with respect, kindness, compassion, understand and appreciating the unity of all life.

⇒ Speaking & acting on the truth that emerges from the heart, the source of human conscience & values.

Non-Violence

⇒ Avoiding causing harm to anyone or anything in our thoughts, words or deeds.

⇒ Appreciate diversity, cultivate tolerance and recognise the unity of all beings & respect for all life.

⇒ Behaving and treating every one equally.

⇒ Do not demean anyone based on their caste, colour, creed, gender, work profile. Not even in your thoughts.

Justice

⇒ right or wrong, good or ill, blame or guiltlessness.

⇒ It is based on fairness, where the equality of every individual before the law is fundamental.

⇒ Justice is expressed in all forms of human interest in and care for living nature, and peace and love.
⇒ Forgiving someone is "truly human".

Responsibility

⇒ The state or fact of having a duty to deal with something or of having control over someone.
⇒ The state or fact of being accountable or to blame for something.
⇒ accountable, answerable for something within one's power, control or management.
⇒ avoid harm to creatures or their environment wherever ~~at~~ avoidable.

Harmony

Harmony with 'SELF'

⇒ Body is the instrument of self and self is seer, doer and enjoyer.
⇒ Humans are co-existence of self & body. and self is the basis of everything we do.
⇒ Desires and expectations are all due to self. Happiness and unhappiness are the states of self.
⇒ Self is conscious in nature and body is physic-chemical in nature.
⇒ 2 attributes : ① powers of the self
② corresponding activities.

Selection → Thoughts → Desire → Thoughts → Selection.

⇒ If we are in conflict with ourself or desires or thoughts then it can affect us in many ways.

(*) Wavering aspirations, lack of confidence, Unhappiness, lack of improvement.

⇒ The pleasure obtained from sensations is short-lived. Start verifying your desires, thoughts & expectations.

⇒ Realise & understand & work accordingly.

Harmony in Family

⇒ Persons related by blood, adoption or marriage and whether or not living together as single housekeeping unit.

⇒ Basic unit of interaction is a natural learning ground for the human being to understand the harmony in relationship with others in the society.

⇒ Family :
- Parents are kid's role model. Kids' well being depends upon their conduct.
- Kids need emotional & monetary support.
- Respect old generation
- Avoid disconnect & maintain communication.

⇒ Strengthen the family by :

Justice	Trust
Respect	Affection
Care	Love

You meet someone with affection in a social gathering.

Affection is social interaction of feelings for love.
Love is strong affection and personal attachment.

Harmony in Society

⇒ Natural acceptance (understand the people around us, respect them and accept for who they are) is to feel related to every one.

⇒ This is our world family by the bonds of functional interdependence, language, cultural or national identity.

⇒ A feeling of relatedness with all is the basis of an undivided society.

Harmony with Nature

⇒ Related to respect for other human beings and nature to establish the universal order.

⇒ We have disturbed ecological balance and our production activities have upset the cycles in nature.

⇒ Nature renews & replenishes resources & man destroys them.

⇒ Chemical pesticides & fertilizers & madness for profit has become general motivation

⇒ Respect.

Indian Pluralism

↳ Nehru's idea of India was 'Unity in Diversity'

↳ Major religions are practised here.

~~Hindu, Muslim, Sikh.~~ Zoroastrianism,

Hinduism , Islam ,

Sikhism , Christianity ,

Buddism , Jainism etc...

↳ Variety in food habits, costume, social customs etc. Geographically, also, our land is diverse and climate-wise too.
↳ Still, India is a political entity, governed under the same Constitution.

National Integration
↳ Awareness of a common identity amongst the citizens of a country. We all are one.
→ Secularism, Democracy, National festivals, Five Year Plans of National Symbols.
→ 1st we are Indians and then we belong to any state or religion

Factors that harm NI
→ Communalism, Linguistic differences, Casteism.

Greek cultural values
↳ culture of Greece
↳ origin of western culture & literature
↳ Roman theatre (comedy genre introduced)

Chinese cultural values
↳ Buddhism is highly practised
↳ Calligraphy is used
↳ Martial arts → birth place [Kung fu, wushu]
↳ Cuisine, tea culture, food ethics ★

Rome
→ Christianity religion
→ Latin language

China.
→ Buddhism & Confucianism
→ Mandarin & Cantonese

* Sensitization of Impact of Modern Education & Media on Values:

a) Impact of Science & Technology.

Positive
↳ Economic growth & development
↳ Sustainable & quality of life
↳ Solving world probs.
↳ Connected world.

Negative
↳ Environmental impact
↳ Impact on society
↳ pollution, unemployement
toxic waste generation

b) Effects on printed media & television on Values.

Positive
↳ Reinforces attachment with society.
↳ coverage of crisis, good deeds, calamities.
↳ Promotion of social causes

Negative
↳ Bloating of events, reporting without sufficient info.
↳ We think media is impartial but usually it is not.
↳ People lose empathising & to help people directly.

c) Effect of computer aided media on Values
↳ Instant Comm^n.
↳ connected & united world.
↳ use for education
↳ can be used for noble causes, raise funds for disaster

↳ Cyber Crime
↳ addiction, time waste.
↳ Health
↳ Wasteful spending,
↳ Social Media stress, ~~activity~~, anxiety, loneliness etc.

d) Role of teacher in the preservation of tradition & culture.

↳ Pass on the legacy of our older generation to the newer ones in the future.

↳ Guide and motivate us.

↳ Rule out ~~illet~~ illiteracy from society.

↳ Make them learn to ~~presern~~ preserve our culture & remove orthodon thinking which can harm the society.

↳ Teacher represents knowledge to the students which bring alterations to the society and nation. ~~in a that~~

e) Role of family, tradition & community prayers in value development.

Family

↳ In joint family systems, the presence of elders in the family plays effective role of moral development in children.

Traditions

↳ Sense of comfort & belonging, bring families together, celebrations, "thank you's, good memories, celebrate diversity, and unite as a country.

↳ Learn freedom, faith, integrity, personal responsibility, work ethics, being self less & try to become independent.

Community prayers

↳ Form of service to the almighty & people, act of obedience, communicating, promote kingdom of God, spiritual living, gain power & confidence, like a therapy,

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Review of Professional Ethics

↳ Professional ethics may be defined as a form of applied ethics that examines ethical principles and ethical problems that arise in a business environment.

Accountability

↳ A virtue in career practise that requires practitioners or service providers to show responsibility for all action that they undertake during their practise.

↳ Models of accountability:

- Individual level: for his/her own work.
- Department level: within the orgn. in which they work.
- Organisation level: as a senior member of staff, for the orgn performance & more widely for its provision of local services.

↳ Importance:

- Needs will be met.
- Deter future violations, promote respect for the law.
- Handle payments.

Collegiality

↳ Colleagues are those who explicitly unite in a common purpose & respecting each other's abilities to work toward that purpose.

↳ Collegiality is an idea of respect for another's commitment to the common purpose & ability to work towards it.
↳ Companionship & cooperation b/w colleagues who shares responsibility.

Loyalty
↳ faithfulness or a devotion to a person, country, group or a cause.
↳ Organisational loyalty is a general term and denotes a person's commitment & attachment to the place they work.
↳ Compromises should not take place.
↳ Loyalty with a friend/colleague and saving him/her from a crime is disloyalty to ~~work~~ your organisation and is not acceptable.

Responsibility
↳ Integrity, Objectivity, Competence, Fairness, Confidentiality, Professionalism, Diligence.

Ethical living
↳ Values (Mulya)
- Natural characteristics or svabhava.
- Values are a part of ethical conduct.
- Values need not be imposed through fear, greed or blind belief.

↳ Policy (Niti)
- Through values and harmony, we develop ethical sense in all our actions.

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- 3 parts:
  Economic Policy (enrichment of wealth)
  Political Policy (protection of body & wealth)
  Policy for Universal Human Order (right utilization of mind, body and wealth)

↳ Character (Charitra)

- A definite desire, thought and selection gives definiteness to our living.
  ↳ ~~Infact~~ Chastity in a relationship
  ↳ Rightful production, ~~to acquire~~ acquisition & utilization of wealth
  ↳ Kindness in behaviour & work.

Engineers as Role Model

↳ shall ~~not~~ perform services only in the areas of their competence.
↳ shall issue public statements only in an objective and truthful manner.
↳ avoid deceptive acts
↳ all conduct should be avoided that deceives the public
↳ high standards of honesty & integrity.
↳ maintain confidentiality
↳ should not untruthfully criticize others.
↳ accept personal responsibility for prof. activities.
↳ should appreciate others.
↳ shall not be influenced & have conflicting disasterous interests.

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4 orders of living.

1. Living with harmony in myself
   ↳ peace of mind, body & soul.
2. Living with harmony in family.
   ↳ empathise, affection & respect & love.
3. Living with harmony in society.
   ↳ responsibility, growtvely, compassionate.
4. Living with harmony in nature or existence
   ↳ respect, equality, considerate, not destroy.

Holistic Technology (Eco-friendly systems)

1. human health & environmental impacts should be less and evaluate them time to time.
2. Conduct assessment of alternatives.
3. Make recyclable & reused goods.
4. Substitute chemicals with natural products.

~~4 Steps~~

4 Concepts for Environment Friendly Systems

(1) Design for environmental processing & manufacturing
   ↳ extraction of minerals, processing etc. should not cause harm to workers.
(2) Design for environmental packaging
   ↳ less plastic, unnecessary paper use, recycle
(3) Design for disposal/reuse
   ↳ reuse products & refurbish them.
(4) Design for energy efficiency
   ↳ reduce energy consumption to increase the product's life.

Sustainable technology

Solar cells
Hydel Power Systems
Wave Energy Systems
Muscle power
Tidal energy

Unit II

Engineers responsibility for safety

Safety & Risks
↳ manage risks, eliminate or reduce it to acceptance levels.

Risk ⇒ combination of probability of a failure event & the severity resulting from the failure.

Safety	Risk
Bridge is made with all reqmts of support on the sides.	Overloaded bridge.

Risk Benefit analysis

↳ Comparison of the risk of a situation to its related benefits.
↳ We accept a certain level of risk in our lives as necessary to achieve certain benefits.
↳ Voluntary risk (driving a car) is taken when people are confident & focused.

Testing methods for safety
↳ Fault mode & effects analysis
↳ Fault tree analysis.

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Failure Mode & Effects Analysis

↳ Bottom to Top study and inductive analytical method. performed at functional level.

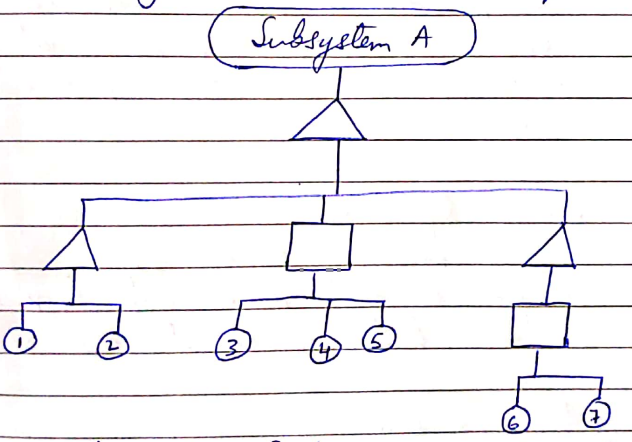
↳ Failure modes are identified for each function and are described & assigned a probability based on failure rate & ratio.

↳ Failure Mode Effects Summary is provided.

Fault Tree Analysis (FTA)

↳ Top down study & deductive analytical method.

↳ may be qualitative or quantitative.



↳ When failure or event probabilities are unknown, qualitative are analysed for minimal cut sets.

↳ Quantitative is used to compute top event probability.

Prevent failure

↳ isolate valves, containment barriers, testing, safety critical systems.

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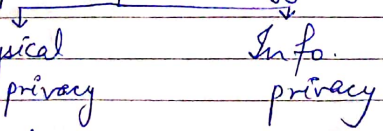
★ Engineer's Responsibility for Safety Social and Value dimensions of Technology
↳ Technology & society are critical & must have harmony.
↳ Technology illustrates benefits, if the society accepts it.
↳ should not raise social & ethical issues.

Technology Pessimism
↳ -ve view of effects on human life.
↳ they point out undesirable aspects of tech. development
↳ harm the environment, aspects of human experience is better, spiritual aspects.
↳ destroy meaningfulness of much that we do.

Technology Optimism
↳ human well being.
↳ provide basic needs & luxuries.
↳ overwhelming on the +ve side.

Computer Technology Privacy



→ Additional personal info should be collected, only if necessary, with informed consent.
→ secure systems, integrity, confidentiality, privacy policy.

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Case Studies

Bhopal Gas Tragedy. (1984)

Background

↳ Union Carbide of USA wanted to experiment with wide range of paresites. (Sevin) ⇒ to be created.

↳ Methyl Iso cyanate (MIC) was very reactive if came in contact with few water drops or metal dust, it is uncontrollable.

↳ It had to be kept around 0°C.

↳ In 1966, GOI granted license to Union Carbide India Ltd (UCIL).

↳ 1984, the inspection report was not good. Corrosion of automatic spinklers were detected.

Catastrophe

↳ December 3rd/4th, 1984, forty tons of MIC leaked which spread throughout the city.

↳ water carrying material entered MIC storage tank.

↳ No alarm was sounded & no prevention could take place.

↳ 10,000 people died & 30k to 50k ill critically.

Analysis

↳ MIC tank was filled 87% and not 50% which was permissible limit.

↳ Not at 0°C. Gauges, detectors defective.

↳ under repair & workforce was half.
↳ No inspection was done regularly.
↳ UCIL did not inform, it was MIC chemical
↳ UCIL escaped with a petty settlement with Supreme Court of India and lakhs of people continued to suffer the catastrophe.

Chernobyl Nuclear Power Plant (1986)

↳ No. 4 reactor, Ukrainian SSR, Soviet Union
↳ On 25 April, 1986, routine shutdown was taking place and new regulators were to be tested. The test took long and carried out till 26 April.
(2% U-235 Uranium dioxide fuel)
↳ By the time it was to be shutdown, the reactor was extremely unstable.
↳ Steam production took place & increased the pressure causing steam explosion.
↳ Second explosion also took place due to fission reaction causing fires, release of radioactivity in the environment.
↳ 200-300 tones of water per hour was used to lower the temp but it was stopped as it flooded tank 1 & tank 2.
↳ 500 tons of boron, sand, clay, lead was dropped from helicopter to extinguish the blaze till 10th day of the incident.

Impact
↳ thyroid cancer increase took place.
↳ radiation doses were given to people.
↳ 2 workers died on the night of the incident and 28 people died in later weeks.

Conclusions of Chernobyl Today

↳ Resettlement of areas from which people were relocated is ongoing.
↳ 30 operators of fireman died in 3 months.
↳ ~~Radiation~~. Acute radiation syndromes was diagnosed.
↳ highly reactive material is buried deep.
↳ lead to many Graphite fires. A red glow was observed due to graphite at 700°C.

The Three Mile Island (Nuclear Power Plant)

↳ Pennsylvania, U.S.A. (1979)
↳ the feed pump, turbine water loop, stopped operating. So steam could not be removed from steam generator.
↳ control rods dropped and fission reactions started.
↳ relief valve was opened and when pressure was controlled & valve was not closed properly.
↳ steam & water escaped & water flowed in drain tank. Reactor lost water & got hotter.
↳ pressure dropped, steam generated, water filled pressuriser and steam surrounded reactor fuel, so, fuel pellets heated up.
↳ turned off entering water as pressuriser was full. & Eventually they turned off everything with no water to cool and melting of fuel pellets.
↳ Later, the core was left uncovered & radioactive water flowed & Xe, Kr & I leaked causing ~~no~~ radioactive radiations.

↳ Chemical reactions in the melting fuel created a large Hydrogen bubble in the dome and could explode. But due to lack of oxygen that didn't explode.

Investigations → operators were "inappropriate"
↳ workers followed the procedures read but procedures were inadequate.

Space Shuttle "Challenger" Disaster

↳ reusable space shuttle. (Jan 28 1986)
↳ The reason of "Challenger" accident was the failure of the joint of the right solid rocket motor.
↳ NASA knew the problem and considered it as acceptable & unavoidable.
↳ It broke within 73 seconds into its flight, leading to the deaths of 7 crew members.
↳ Disintegration of the vehicle began after an O-ring seal in its right solid rocket booster failed at lift off, due to structural failure of external tank.
↳ Aerodynamics forces broke up the orbiter.
↳ NASA managers knew about the flaw since 1977, but did not address it.
↳ disregared warnings which can cause due to low temperature on the morning of launch date.
↳ Later investigation proved the failure

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in the O-rings seal.

↳ Must consider engineers' safety, ethics of whistle-blowing (launch), communication, group decision-making & dangers & risks involved.

2.6 CASE STUDIES OF FAILURE IN SAFETY SYSTEMS

Man has developed science for his comforts and dominance over others and has set up industries, power plants and many other facilities in last few decades. Many industrial accidents /disasters have happened in the world in which lots of lives were lost and there are thousands who are still suffering for years without any respite. Given below are few of the cases which got prominence in news on account of the failure of nuclear plants and equipments and sufferings of mankind at the hands of the installation of industry/facilities.

(*i*) On *December 12, 1952*, a partial meltdown of a reactor's uranium core at the Chalk River plant near Ottawa, Canada, resulted after the accidental removal of four control rods. Millions of gallons of radioactive water poured out of the reactor but, there were no injuries.

(*ii*) In *October, 1957*, fire destroyed the core of a plutonium-producing reactor at Britain's Windscale nuclear complex, sending clouds of radioactivity into the atmosphere. An official report said the leaked radiation caused dozens of cancer deaths in the vicinity of Liverpool.

(*iii*) In *1957-58*, a serious accident occurred near the town of Kyshtym in the Urals. A Russian scientist who first reported the disaster estimated that hundreds died from radiation sickness.

(*iv*) On *January 3, 1961*, three technicians died at a U.S. plant in Idaho Falls in an accident at an experimental reactor.

(*v*) On *July 4, 1961*, radiation spread through the Soviet Union's first nuclear-powered submarine, when a pipe in the control system of one of the two reactors had ruptured. The Captain and seven crew members died.

(*vi*) On October 5, 1966, the core of an experimental reactor near Detroit, Mich., USA melted partially when a sodium cooling system failed.

(*vii*) On *January 21, 1969*, a coolant malfunction from an experimental underground reactor at Lucens Vad, Switzerland, released a large amount of radiation into a cave, which was then sealed.

(*viii*) On *December 7, 1975*, at the Lubmin nuclear power complex on the Baltic coast in the former East Germany, a short-circuit caused by an electrician's mistake started a fire. Some news reports said there was almost a meltdown of the reactor core.

(*ix*) On *March 28, 1979*, near Harrisburg, Pennsylvania, America's worst nuclear accident occurred. A partial meltdown of one of the reactors forced the evacuation of the residents after radioactive gas escaped into the atmosphere. It was later known as Three Mile Island nuclear power plant accident.

(*x*) On *February 11, 1981*, eight workers were contaminated when more than 100,000 gallons of radioactive coolant fluid leaked into the contaminant building of the Tennessee Valley Authority's Sequoyah 1 plant in Tennessee.

(*xi*) On *April 25, 1981*, officials said around 45 workers were exposed to radioactivity during repairs to a plant at Tsuruga, Japan.