Introduction

- **Morals**: What a person thinks is right or wrong, based on their own beliefs.
- **Ethics**: Rules about how people should act, made by a group or society. If someone breaks these rules, people might not like it.
- **Laws**: Rules made by the government to tell people what they can or cannot do. If someone breaks a law, they can be punished.
- **Profession:** A type of job that needs special training and skills and has strict rules about how people should do their work.
- **Professional Ethics**: Rules and standards that professionals follow to do their job in the right way.

Herbert Hoover on Engineering Ethics:

> Engineering is a great job. Engineers use science to create things like buildings, machines, or energy systems. Their work helps people by creating jobs, homes, and making life better. Unlike other jobs, engineers' mistakes are easy to see. They cannot hide errors like doctors, lawyers, or politicians can. If their work fails, everyone knows it. This makes engineering a big responsibility.

Engineering Ethics:

- The responsibilities and rights engineers should follow in their work.
- The good ideas and promises engineers aim for in their job.
- The study of what is morally right when making decisions or rules in engineering tasks and research.

Why study Engineering Ethics?

Desirable Outcomes:

- Understand right and wrong better (ethical sensitivity).
- Learn important rules of behavior (knowledge of standards).
- Make better decisions about right and wrong (ethical judgment).
- Be stronger in doing the right thing (ethical willpower).

Practical Skills:

- **Moral awareness**: Spotting what is right and wrong.
- **Moral reasoning**: Thinking about both sides of a problem.
- **Moral coherence**: Making ideas fit together clearly.
- **Moral imagination**: Finding new and creative solutions.
- **Moral communication**: Sharing and explaining your ideas.

Ethical Codes

IEEE Code of Ethics (Highlights):

1. Prioritize safety, health, and welfare of the public.
2. Avoid conflicts of interest and disclose them when they occur.
3. Be honest and realistic with claims and data.
4. Reject bribery in all forms.
5. Improve understanding and application of technology.
6. Maintain and improve technical skills and undertake tasks only if qualified.
7. Accept and offer constructive criticism, acknowledge errors, and credit others.
8. Treat everyone fairly, regardless of race, religion, gender, disability, or age.
9. Avoid harm to others' property, reputation, or employment.
10. Help colleagues grow professionally and follow the code of ethics.

National Society of Professional Engineers (NSPE) Code of Ethics (Basic Rules):

1. Always keep people safe and healthy.
2. Work only in areas you know well.
3. Be honest when you make public statements.
4. Be loyal to your boss or clients.
5. Do not lie or cheat.
6. Act responsibly, follow the rules, and be respectful to make the job better for everyone.

تقاليد وآداب المهنة – نقابة المهندسين:

1. يجب على العضو الالتزام بمبادئ الشرف والنزاهة في جميع تصرفاته وأداء واجباته بإخلاص.
2. حماية مهنة الهندسة والتعامل بلطف واحترام مع الزملاء، مع الامتناع عن انتقاد أعمال الآخرين علنًا أو السعي لمنافستهم بطريقة غير أخلاقية.
3. الامتناع عن الترويج لنفسه أو إنجازاته بهدف جذب العملاء باستخدام إعلانات أو وسطاء.
4. عدم تقديم رأي في موضوع هندسي دون معرفة كافية أو تحقق من الحقائق.
5. عدم السماح للمصلحة الشخصية بالتأثير سلبًا على العمل الهندسي، وتوضيح أي تعارضات مهنية مسبقًا.
6. الحفاظ على سرية أي معلومات فنية أو مالية تتعلق بالعمل، وعدم مشاركتها إلا بموافقة المعني.
7. عدم قبول مكافآت أو عمولات من أكثر من جهة لنفس الخدمة دون موافقة جميع الأطراف.
8. منع الأعضاء العاملين في المؤسسات الحكومية أو الرسمية من ممارسة أعمال هندسية حرة تتعارض مع قوانين الدائرة.
9. الامتناع عن استغلال الوظائف الحكومية لجذب العملاء بشكل مباشر أو غير مباشر.
10. يُحظر على العضو العمل المتفرق لأكثر من جهة واحدة في نفس الوقت.

Conflict of Interest:

A situation where a person’s personal interests could affect their professional decisions or actions, leading to unfair or unethical outcomes.

Dilemmas

- **Moral Dilemma**: A personal conflict between what is right or wrong based on personal values.
    - *Example*: Deciding whether to tell a painful truth or lie to protect someone.

- **Ethical Dilemma**: A conflict between professional or societal standards where any choice may violate an ethical principle.
    - *Example*: A nurse deciding whether to follow a doctor's risky order or prioritize patient safety.

- **Ethical Issue**: A broader problem about fairness, justice, or responsibility that may not need an immediate decision.
    - *Example*: A company knowingly harming the environment through its practices.

Ethical Dilemmas:

- Situations where it is hard to decide what is right or wrong.
- Or when it is not clear how to apply moral values to solve the problem.

Examples of Ethical Dilemmas:

- Doing medical tests on people.
- Reporting bad actions by your boss (whistle-blowing).
- A conflict shown in the movie "Crimson Tide" between Denzel Washington and Gene Hackman: There was a conflict between two leaders on a U.S. nuclear submarine. The dilemma arises when they receive partial orders about launching nuclear missiles. Hackman's character believes they should launch immediately, while Washington's character argues they must confirm the orders first to avoid starting a nuclear war by mistake. The ethical conflict is about balancing duty and the potential consequences of their actions.

Resolving Ethical Dilemmas:

1. **Understand moral values**: Know what is right and important in the situation.
2. **Clarify key ideas**: Make sure you understand all important concepts.
3. **Know the facts**: Collect all necessary information.
4. **Consider the options**: Think about all possible choices.
5. **Make a fair decision**: Choose the best option based on reasoning.
    - **Example**: A factory polluting soil or water.

Why We Disagree:

1. Most people agree on basic morals, but still argue sometimes.
2. Disagreements are often about facts, not values.
3. Sometimes, people argue about what concepts mean or how to use them in a situation.

Frameworks

1. Kantianism (Duty Ethics)

- **Good Will**: The desire to do what is morally right. According to Kant, a good will is the only thing that is always good.
- **Moral Rules**: Act according to rules that could be universal laws for everyone.
    - **Example**: If you make promises intending to break them, promises would lose their meaning. Thus, lying is wrong.
- **Treat People with Respect**: Always treat others as valuable, not as tools to achieve your goals.
    - **Example**: Using someone just to pass an exam is wrong because it disrespects them.
- **Strengths**: Kantianism ensures fairness, values every person equally, and creates universal rules.
- **Challenges**: It can't solve conflicts between duties, e.g., lying to protect someone.

2. Act Utilitarianism

- **Principle of Utility**: Actions are good if they create more happiness than harm.
    - **Happiness** = pleasure or benefit.
    - **Unhappiness** = pain or harm.
- **Key Idea**: Focuses on the results of an action, not the intention.
    - **Example**: If building a highway reduces travel costs but destroys homes and habitats, weigh the benefits and costs. If benefits are greater, it is morally good.
- **Strengths**: Practical, focuses on happiness, and considers everyone affected.
- **Challenges**: Hard to predict outcomes and measure happiness; doesn't consider fairness or justice.

3. Rule Utilitarianism

- **Key Idea**: Follow moral rules that, if everyone obeyed, would maximize happiness.
    - **Example**: A helpful computer worm that fixes security issues could harm networks and invade privacy. So, creating such worms violates rules about respecting privacy and safety.
- **Strengths**: Simplifies decisions, avoids unfair outcomes, and works in many cases.
- **Challenges**: Doesn't always address conflicts between rules and justice.

Key Scenarios and Examples

- **Plagiarism (Kantianism)**: A student buys and submits a report.
    - **First Method**: If everyone plagiarized, reports wouldn't show real knowledge, making the rule meaningless.
    - **Second Method**: The student uses the professor as a tool to pass the course, which is wrong.
- **Highway Construction (Act Utilitarianism)**: Replacing a curvy road with a shorter one.
    - Benefits: $39M saved in driving costs.

    - Costs: $31M to build and compensate homeowners, plus habitat loss.
    - Decision: Benefits outweigh costs, so the highway is good.
- **Anti-Worm (Rule Utilitarianism)**: A worm that fixes computer issues.
    - **Problem**: Causes network harm and invades privacy.
    - **Conclusion**: Breaking rules about privacy outweighs the benefits.

Comparison of Theories

Feature	Kantianism	Act Utilitarianism	Rule Utilitarianism
Focus	Following universal rules	Maximizing happiness	Following happiness-based rules
Strengths	Fair, values everyone equally	Practical, results-focused	Simplifies decisions
Weakness	Can't solve rule conflicts	Hard to predict outcomes	Can overlook unique cases

Summary

- Kantianism ensures fairness but struggles with conflicting duties.
- Act Utilitarianism focuses on results but may ignore justice.
- Rule Utilitarianism creates general rules for happiness but may miss individual cases.

Cases

1. Boeing 737 MAX Crashes

- **What happened**:
  - Two tragic crashes: Lion Air Flight 610 (October 2018) and Ethiopian Airlines Flight 302 (March 2019).
  - 346 people died due to a faulty MCAS system.
  - Boeing relied on one sensor, lacked proper pilot training, and hid risks to save costs.
- **Moral Dilemma**: Should Boeing have prioritized safety over profits?
- **Ethical Dilemma**: Is it ethical to withhold safety information to avoid higher costs?
- **Ethical Issues**:
  - **Conflict of Interest**: Boeing self-certified its safety features, compromising safety.
  - **Transparency**: Hiding the risks of the MCAS system.
  - **Responsibility**: Failure to act after the first crash.
- **Analyses**:
  - **Kantianism**: Boeing treated passengers and pilots as tools for profit, violating the duty to respect human life.
  - **Act Utilitarianism**: The deaths (harm) outweighed the cost savings (benefit), making it unethical.
  - **Rule Utilitarianism**: If all companies hid safety flaws, public trust in aviation would collapse, so it was wrong.

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2. Challenger Space Shuttle Disaster

- **What happened**:
  - NASA's Challenger shuttle exploded 73 seconds after liftoff on January 28, 1986.
  - The O-rings failed due to cold weather, and engineers warned of this issue.
  - NASA ignored warnings to meet the launch schedule.
  - Seven crew members, including a teacher, died.
- **Moral Dilemma**: Should the launch have been delayed despite public expectations?
- **Ethical Dilemma**: Was it ethical to prioritize the schedule over safety?
- **Ethical Issues**:
  - **Neglecting Warnings**: Engineers highlighted the risks, but management ignored them.
  - **Risking Lives**: Choosing deadlines over safety precautions.
  - **Communication Breakdown**: Poor collaboration between engineers and decision-makers.
- **Analyses**:
  - **Kantianism**: Ignoring risks violated the duty to protect human lives.
  - **Act Utilitarianism**: The harm (loss of lives and public trust) far outweighed the benefit (sticking to the schedule).
  - **Rule Utilitarianism**: If organizations ignored safety for deadlines, disasters would increase, so it was unethical.

3. Volkswagen Emissions Scandal

- **What happened**:
  - In 2015, VW installed "defeat devices" in cars to cheat emissions tests.
  - The cars appeared eco-friendly during testing but emitted pollutants 40 times the legal limit during real driving.
  - VW deceived customers, damaged the environment, and faced heavy fines.
- **Moral Dilemma**: Should Volkswagen have been honest even if it risked profits?
- **Ethical Dilemma**: Was it ethical to mislead regulators and customers for financial gain?
- **Ethical Issues**:
  - **Cheating**: VW manipulated emissions tests.
  - **Environmental Harm**: Cars polluted more than claimed, damaging ecosystems.
  - **Deception**: Misleading customers about being environmentally friendly.
- **Analyses**:
  - **Kantianism**: VW treated customers as tools for profit, violating honesty and respect.
  - **Act Utilitarianism**: The harm (pollution, broken trust) outweighed the short-term benefits (profits).
  - **Rule Utilitarianism**: If all companies cheated, regulations would fail, making the act unethical.

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4. Habit-Forming Apps

- **What happened**:
  - Apps use psychological tricks (Hook Model) to keep users engaged, causing addiction and overuse.
  - Users lose time, face mental health issues, and suffer from privacy exploitation.
  - Developers prioritize profit over user well-being.
- **Moral Dilemma**: Should developers create apps that respect users' time and mental health?
- **Ethical Dilemma**: Is it ethical to exploit users' behavior for financial gain?
- **Ethical Issues**:
  - **User Manipulation**: Designing apps to exploit user habits.
  - **Privacy Exploitation**: Collecting and using personal data without transparency.
  - **Mental Health Impact**: Encouraging overuse, leading to stress and anxiety.
- **Analyses**:
  - **Kantianism**: Manipulating users for profit disrespects their autonomy, making it unethical.
  - **Act Utilitarianism**: The harm (addiction, mental health issues) outweighs the entertainment benefits.
  - **Rule Utilitarianism**: Encouraging habit-forming designs harms society and users, making it wrong.