

ME290

**Global Engineering Professional
Seminar**

Engineering Ethics
Lecture-1



Engineering Ethics

ABET* requirement: General Criterion 3. Student Outcomes

The program must have documented student outcomes that prepare graduates to attain the program educational objectives:

- 4. an ability to recognize **ethical** and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

*ABET (Accreditation Board for Engineering and Technology, Inc.) is an organization that accredits post-secondary education programs.

Definition of Ethics

- Moral principles that govern a person's behavior or the conducting of an activity*



[*https://en.oxforddictionaries.com/definition/ethics](https://en.oxforddictionaries.com/definition/ethics)



AUM

American University Of The Middle East



What are engineering ethics?

Differences

Common morality

is the set of moral ideals shared by most members of a culture or society.

Personal ethics is the set of ones own ethical commitments.

Professional Ethics

is the set of standards adopted by professionals in so far as they see themselves acting as professionals. It can be different from personal ethics and common morality.

Any standards for Eng. Ethics?

Consider the cases as a professional engineer.



- What you have to consider when making decisions in those cases.
- According to what standards are these actions right or wrong in those cases.

NSPE* Code of Ethics of Engineers

I. The Fundamental Canons (Rules)

Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct:

1. *Hold paramount the safety, health, and welfare of the public.*
2. *Perform services only in areas of their competence.*
3. *Issue public statements only in an objective and truthful manner.*
4. *Act for each employer or client as faithful agents or trustees.*
5. *Avoid deceptive (dishonest) acts.*
6. *Conduct themselves honorably, responsibly, ethically and lawfully so as to enhance the honor, reputation, and usefulness of the profession.*

NSPE* Code of Ethics of Engineers

II. Rules of Practice

- 1. Engineers shall hold paramount the safety, health, and welfare of the public.*
- 2. Engineers shall Perform services only in areas of their competence.*
- 3. Engineers shall Issue public statements only in an objective and truthful manner.*
- 4. Engineers shall act for each employer or client as faithful agents or trustees.*
- 5. Engineers shall avoid deceptive (dishonest) acts.*

ASME* Code of Ethics of Engineers

The Fundamental Principles

Engineers support and advance the integrity, honor and dignity of the engineering profession by:

- I. *using their knowledge and skill for the enhancement of human welfare;*
- II. *being honest and impartial, and serving with fidelity their clients (including their employers) and the public; and*
- III. *struggling to increase the competence and prestige of the engineering profession.*



Example Case 1:

You are asked by the government to verify that a certain industry will not leak **toxic** substances into the environment. After doing a study you discover that:

- The industry will likely cause harm within the coming 5 years, but there is significant uncertainty.
- The industry cannot be evaluated more carefully unless it is shut down immediately.
- Both the environment and the neighboring community are at risk

Example Case 1:

After reading your report, the boss asks you to modify your report so as to reflect that the industry is actually safe.

- He claims that changing the report will protect the public in the area, preventing panic while the government attempts to shut down and fix the facility.
- What do you do?



Example Case 1:

The conflict is between your obligations as an engineer and your obligations as a citizen.

- The code of ethics requires that you safeguard the public's welfare. It also requires that you tell the truth when making public statements concerning your area of engineering (*NSPE Code: The Fundamental Canons [Rules] 1 and 3*)
- This means that you cannot alter data as an engineer, and that you must tell the truth about the facility.



Professional Obligations



**What are your OBLIGATIONS /
RESPONSIBILITIES as a professional
engineer?**

NSPE* Code of Ethics of Engineers

III. Professional Obligations

1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.
2. Engineers shall at all times strive to serve the public interest.
3. Engineers shall avoid all conduct or practice that cheats the public.
4. Engineers shall not release confidential information, (without agreement) concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.

*National Society of Professional Engineers (NSPE)



NSPE Code of Ethics of Engineers

III. Professional Obligations

5. Engineers shall not be influenced in their professional duties by conflicting interests.
6. Engineers shall no attempt to obtain employment or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods.
7. Engineers shall not attempt to harm, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or employment of other engineers. Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.



NSPE Code of Ethics of Engineers

III. Professional Obligations

8. Engineers shall accept personal responsibility for their professional activities, provided, however, that engineers may seek indemnification for services arising out of their for other than gross negligence, where the engineer's interests cannot otherwise be protected.
9. Engineers shall give credit (reference) for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.



Example Case 2: Challenger Disaster January 28, 1986

Shuttle Launch



About 80 seconds after Launch

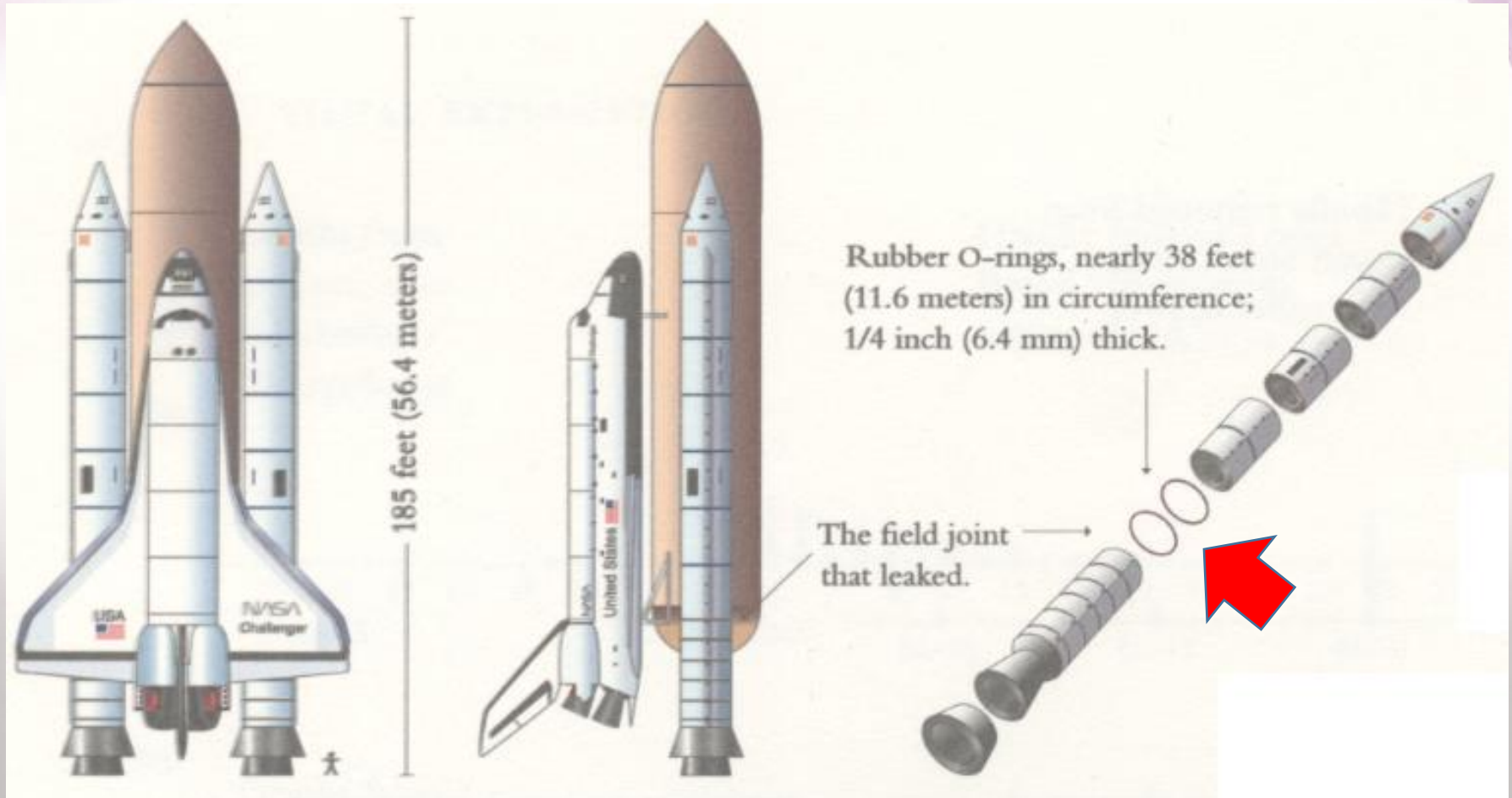


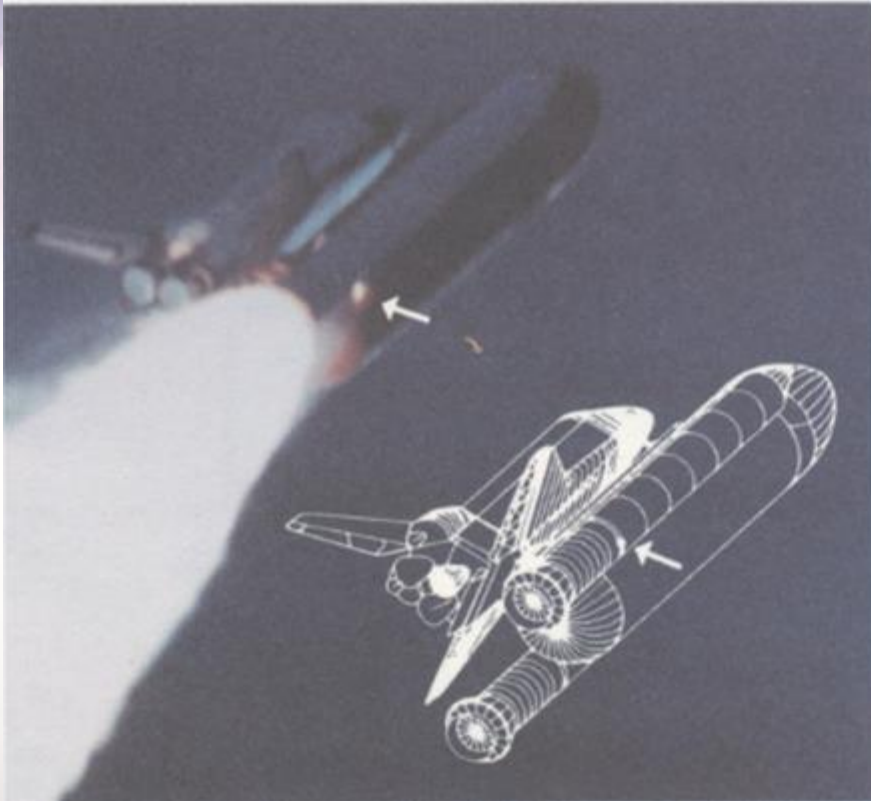


AUM

American University Of The Middle East

Example Case 2:





- In less than 1 second, smoke appeared at the ring joint, indicating that the rings are burnt and failed to seal.
- The leak lasted only about 2 seconds. In less than a minute of ignition when Challenger was 6 miles up – thick flames start evolving.

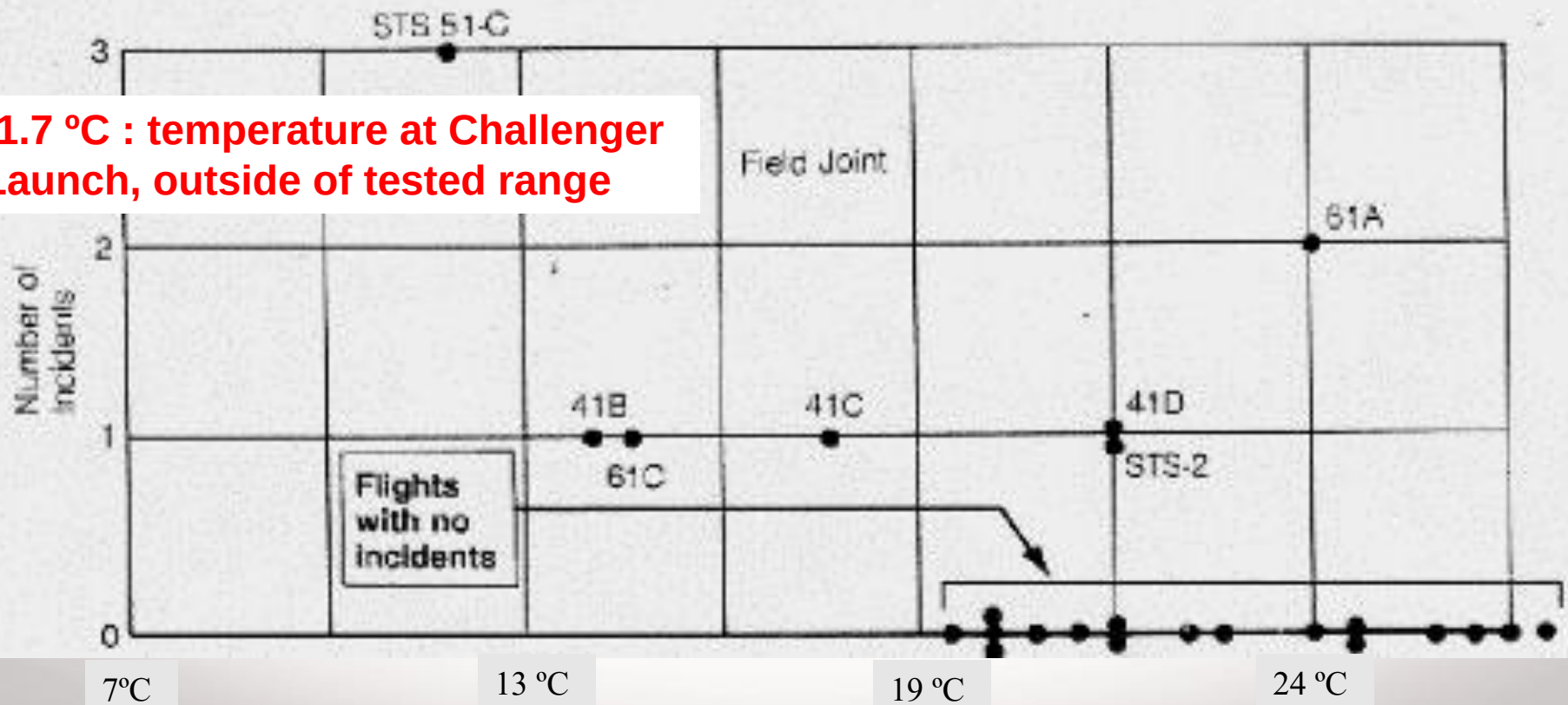


- Shuttle exploded and broke up in 75 seconds. Rockets crisscrossed and continued flying wildly.

Chart Showing Test Data

“It is too cold for launch”

-1.7 °C : temperature at Challenger Launch, outside of tested range



The Investigation

Why the Challenger Blew Up

- Engineers had all the data they needed.
- They knew cold O-Rings were likely to fail.
- Engineering management believed them and told NASA not to launch.
- NASA asked for the supporting data and engineers presented the data poorly.
- NASA was unconvinced. Discussions went to wrong direction: “launch unless you can prove it is unsafe” rather than the typical principle of “**safety first**”
- Due to the pressure to meet the schedule commitment Engineering and management reversed their position and approved the launch.



- Do you think NASA should have launched?
- Did NASA take unnecessary risks because of external pressure?
- Did the engineers violate their duty to put public safety first?
- In the Challenger disaster, obviously the right choice should have been to delay the launch.

Sections of the Code of Ethics for Challenger case:

NSPE Code of Ethics:

(I) Fundamental Canons (Rules)

1. Hold paramount the safety, health, and welfare of the public.
3. Issue public statements only in an objective and truthful manner.
5. Avoid deceptive acts.
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

(II) Rules of Practice

1. Engineers shall hold paramount the safety, health, and welfare of the public.
3. Engineers shall issue public statements only in an objective and truthful manner.
5. Engineers shall avoid deceptive acts.

(III) Professional Obligations

1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.
2. Engineers shall at all times strive to serve the public interest
3. Engineers shall avoid all conduct or practice that deceives the public.
5. Engineers shall not be influenced in their professional duties by conflicting interests.

Principles of Professional Ethics

- Honesty : truthfulness, absence of cheating, lying or theft.



- Integrity : Being a Part of the whole organization.



- Transparency : Accessibility, information, understanding and audit of processes.



Principles of Professional Ethics

- Accountability : Being responsible for actions and consequences, not blaming others.



- Confidentiality : discretion associated with profession, security issues.



- Objectivity : Neutrality, credit your work.



Principles of Professional Ethics

- Respectfulness: Speak to everyone in the same way.



- Copyright : use licensed tools and softwares, ask for permission before diffusion.



- Misappropriation of other's work : Cite your sources and give references.



Principles of Professional Ethics

- Respect to the Law : respect rules and regulations of authorities.
- Whistleblowing : Tell about any violations, frauds, corruptions, mismanagement, etc.



Class Discussion

- A chemical company develops a new process that results in some waste. Their internal studies show this waste can cause **cancer**.
- However, this type of waste is not on a government list of banned chemicals because it is new.

Question: Is it Legal? Ethical?



Class Discussion

- A chemical company develops a new process that results in some waste. Their internal studies show this waste can cause cancer.
- However, this type of waste is not on a government list of banned chemicals because it is new.

Legal? Ethical?

- Answer: Legal, but not ethical

Sections of the Code of Ethics for this case:

NSPE Code of Ethics:

(I) Fundamental Canons (Rules)

1. Hold paramount the safety, health, and welfare of the public.
3. Issue public statements only in an objective and truthful manner.
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

(II) Rules of Practice

1. Engineers shall hold paramount the safety, health, and welfare of the public.

(III) Professional Obligations

1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.
2. Engineers shall at all times strive to serve the public interest
3. Engineers shall avoid all conduct or practice that deceives the public.
5. Engineers shall not be influenced in their professional duties by conflicting interests.

End of “Engineering Ethics”

Lecture-1