GE105
Introduction to Engineering Design
College of Engineering
King Saud University

Studio 12.

Engineering Ethics:
Case Studies

FALL 2016

- **Case Study 1: Murder**
  - Legal?
  - Moral?
  - Ethical?
  - Good Etiquette?

  - Answers:
  - Illegal
  - Immoral
  - Unethical
  - Bad etiquette!

Case Study 2: Driving over the speed limit when you are late for class

- Legal?
- Moral?*
- Ethical?*
- Good Etiquette?

- Answers:
- Illegal
- Moral to some, immoral to others
- Unethical
- Bad etiquette if it effects other drivers

Case Study 3: Driving over the speed limit going to hospital for an emergency case.

- Legal?
- Moral?
- Ethical?
- Good Etiquette?

- Answers:
- Illegal
- Moral
- Ethical
- Etiquette does not apply

Case Study 4: Software piracy

- Ahmed was showing Ali a copy of a software package he got from a friend.
- Ali says, "this is great, but you didn't pay for it, you shouldn't really be using it."
- Ahmed says, "Look, I can't buy it because it is too expensive, so the company hasn't lost a sale. Besides I didn't take a physical object, so it isn't stealing."

What do you think:
- Ahmed is right – there is no problem, he isn't stealing from the company?
- Ahmed should delete the software from his computer?
- Ahmed shouldn't pirate software, but the company is not going to find out, so he should not delete it?*

Case Study 5: Not paying for merchandise

On his way home from work, Ahmed goes into a store, picks up a candy bar and walks out without paying. Ethically, is this the same as pirating software?

- YES
- NO
- In some ways yes and some ways no

Case Study 6: Non-listed toxin

- 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? Moral?

- Answers:
- Legal but immoral (and unethical)*

Case Study 7: Reimbursed payments

- Government self-regulations require that all purchases be made through purchasing agents.
- An engineer wishes to purchase an old alternator from a junkyard and does so with his own money.
- He reimburses himself with computer disks of equivalent value.

Legal? Moral?

Answers:
- Moral but illegal*

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Case study 8: Protecting the Safety of Society

- Your employer asks you to design a bridge that will not exceed $1 million to build. After doing a study you determine the following:
  - ➢ An ideal bridge can be built for $1.5 million.
  - ➢ Given the design constraints, a bridge built for $1 million will collapse in a moderate earthquake.
- Your employer says, "if we don't build the bridge for $1 million, then we are going to have to fire half of the staff, including you."*
- He further asks you to go ahead with the next stage of the project
- What do you do?

What is the conflict?

A. Your duty to your fellow employees vs. your duty to your boss

B. Your duty to society vs. your loyalty to your own career

C. Uncertainty about the maximum magnitude of an earthquake vs. the need to ensure a safe structure.

D. Your duty to be honest to clients vs. your duty to complete the project

What is more important?

- The <u>conflict</u> is between your future <u>employment</u> and the employment of others in your company, and the <u>welfare of society</u>.

- The <u>code of ethics</u> for engineers requires You to take the <u>safety of society as being of paramount importance</u>.

- In a case like this the <u>welfare of society comes first</u>.

## Case Study 9: Truth In Public Statements

- 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 <u>likely cause harm</u> within the coming 5 years, but there is <u>significant uncertainty</u>.

  ➢ The industry cannot be evaluated more carefully unless it is <u>shut down immediately</u>.

  ➢ Both the <u>environment and the neighboring community are at risk</u>

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

- He claims that changing the <u>report will protect the public</u> in the area, <u>preventing panic</u>* while the government attempts to shut down and fix the facility.

- What do you do?

What is the Conflict?

- The conflict is between your <u>obligations as an engineer</u> and your <u>obligations as a citizen</u>*.
- The code of ethics requires that you <u>safeguard the public's welfare</u>. It also requires that you <u>tell the truth</u> when making public statements concerning your area of engineering.
- This means that you <u>cannot alter data</u> as an engineer, and that you must <u>tell the truth about the facility</u>.
- In this case your duty as an engineer to <u>tell the truth when making public statement should win over your civic duty</u>
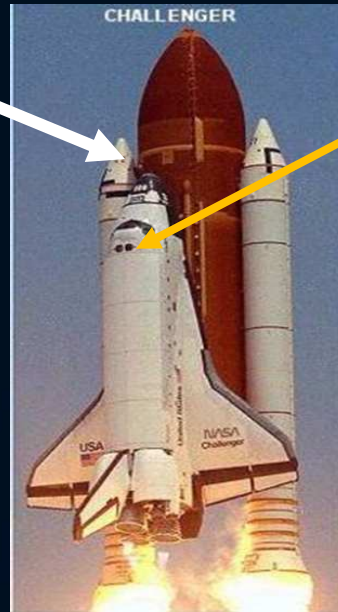- Role <u>conflicts are hard</u>!!!

10. A famous case The Challenger Disaster (January 28, 1986) :
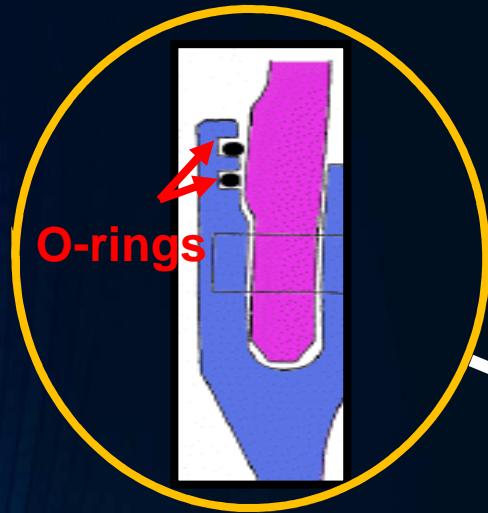
O-rings

Economic considerations
Political pressures
Scheduling difficulties →
NASA decides to launch anyway

Challenger lifts off at 11:37 AM

Explodes 73 seconds after launching

Roger Boisjoly, chief O-ring engineer, had warned his colleagues that O-rings fail at relatively low temperatures

- <u>O-ring seal indeed failed</u>, flames burned the adjacent components and ignited the liquid hydrogen and oxygen in the external fuel tank; which caused orbiter to break apart

- Do you think NASA should have launched? <u>Is there a clear moral issue here</u>?

- Did NASA take unnecessary risks because of external pressure?

- <u>Did the engineers violate their duty</u> to put public safety first?

- Did NASA manager think of the <u>potential costs</u>?
  - Human <u>lives</u>
  - His <u>reputation</u>
  - <u>Criminal charges</u>
  - 100% of the blame on him
  - Suspension of the <u>shuttle program</u>
- How about other elements such as "<u>whistle blowing</u>"?
- *It is a hard choice*. You have to <u>choose between the lesser of two evils</u>.
- In the Challenger disaster, obviously the lesser of two evils choice should have been to <u>delay the launch</u>.

- Watch the following clip on the "[Toyota Unintended Acceleration Case](#)"