



GE105

Introduction to Engineering Design

College of Engineering

King Saud University

## Lecture 12.

# *Engineering Ethics*

FALL 2016

# Before we Start

Ethics is knowing  
the difference  
between what you  
have a right to do  
and what is right  
to do.  
*Potter Stewart*

Ethics are more  
important than  
laws.  
*Wynton Marsalis*

“Educating the  
mind without  
educating the  
heart is no  
education at all.”  
*Aristotle*

“Education  
without values, as  
useful as it is,  
seems rather to  
make man a more  
clever devil.”  
*C.S. Lewis*

# Ethics

- A set of moral values and principles which form the standards of the code of conduct\* of individuals, organizations and professions.
- It is the principles of good and bad behavior governing what is right and wrong conduct.



# Engineering Ethics

Engineering is based on "Preventative Ethics"  
which is based on two dimensions:

Think ahead and  
**anticipate**  
possible  
consequences of  
professional  
actions

Think effectively  
about  
consequences  
and **decide** what  
is the 'ethically'  
correct manner  
to handle the  
situation



## Concepts of Engineering Ethics

- Ethical considerations are an integral part of making engineering decisions.
- The professional obligations of engineers go beyond fulfilling a contract with a client or customer.
- Codes of ethics can provide guidance in the decision-making process
- Ethical obligations do not stop at any country's border; **they are global**



## Engineering Codes of Ethics

- Accreditation Board for Engineering and Technology (ABET)
- National Society of Professional Engineers (**NSPE**)
- Institute of Electrical and Electronic Engineers (IEEE)
- American Society of Mechanical Engineers (ASME)
- American Society of Civil Engineers (ASCE)







## Extract of IEEE Code

- Safety, health and welfare of the public, and to disclose (reveal) promptly factors that might endanger the public or the environment;
- To avoid real or perceived conflicts of interest, and to disclose them to affected parties;
- To be honest and realistic in stating claims or estimates based on available data;
- To reject bribery (corruption) in all its forms;
- To treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin



## Personal Ethics (everyday examples)



- Software piracy
- Copying of homework or tests
- **"Borrowing"** office supplies from employer
- Copying of Videos or CD's
- Plagiarism
- Expense account padding (adding unnecessary material or expenses for the purpose of increasing the cost claim)\*
- Personal use of the copy machine at work

# Ethical Issues are Seldom Black and White\*



Conflicting Demands



Ethical standards are usually relative and personal, there is seldom an absolute standard



## Whistle-Blowing

The term whistle-blower comes from the whistle a referee uses to indicate an illegal or foul play\*.



- Whistleblower is a person who exposes misconduct or illegal activity occurring in an organization such as fraud, health and safety violations, and corruption.
- Whistleblowers may make their allegations internally (within the accused organization) or externally (to regulators, law enforcement agencies, to the media or to groups concerned with the issues)



## Whistle-Blowing (contn'd)



- It is morally permissible for engineers to engage in external whistle-blowing if:
  - ✓ The harm that will be done to the public is serious and considerable
  - ✓ Getting no satisfaction from their immediate superiors, even after going to the board of directors
- Need a documented evidence that would convince a reasonable, impartial observer
- There must be strong evidence that making the information public will in fact prevent the threatened harm\*

## Case Studies in Engineering Ethics

### Case 1: The "challenger" disaster (1986)

Designed a system that required a gasketed connection and did not have sufficient data to predict performance across a spectrum of conditions; pressure from management to end the job lead to:

- Poor Engineering Judgment
- Entire crew lost
- Space program set back years
- Lost public confidence



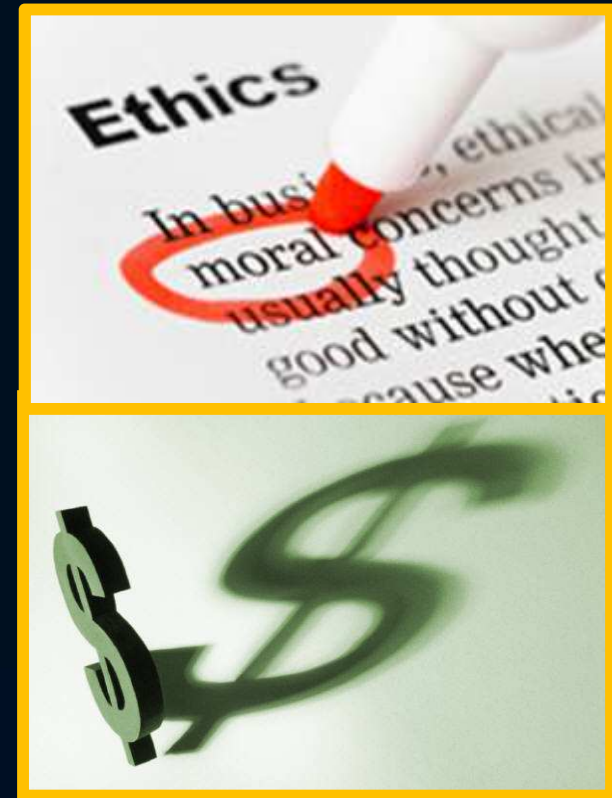
## Case 2: The "Ford Pinto" Gas Tank (1972)

- Under management pressure, engineers designed an automobile component\* that later proved to fail under certain conditions and could be replaced for only \$11 under a recall
- At \$11 per vehicle to recall, the total cost would be \$137 million
- Corporate decision based on a "Benefit/Cost analysis"
- Fearing the loss, Ford did not recall for repair



## Case 2 (contn'd)

- Over 500 documented deaths related to rear-end collisions in the Pintos
- Hundreds of serious injuries and thousands of burned vehicles
- Lawsuits and personal injury cases totaled over \$450 million
- Company nearly folded after the lawsuits and low sales due to lack of trust in Ford products

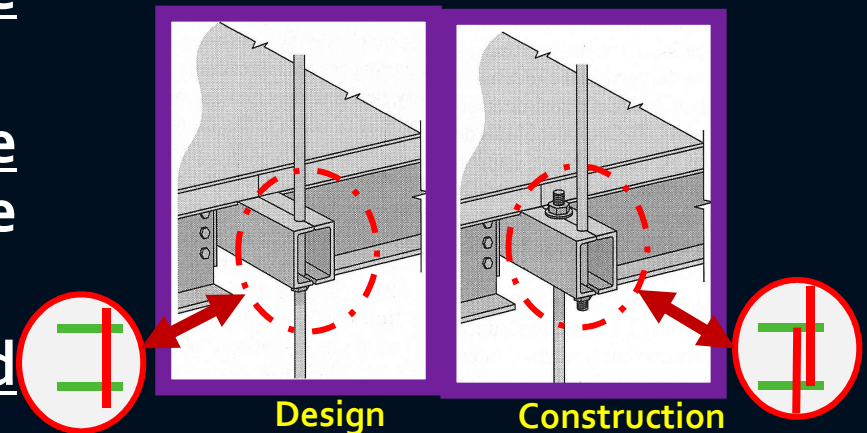




## Case 3: The "Hyatt Regency" (Kansas City 1981)

Engineers were asked to sign on a set of shop drawings that had come from a reliable vendor with whom they had a very good working relationship

- Support system was changed in the shop drawings by the steel fabricator
- Engineer failed to review the shop drawings and therefore did not discover the change
- The change doubled the load on the supports
- 32 ton walkways collapsed
- 114 deaths, 200 injuries
- Engineers prosecuted



## Ask yourself (when Making Decisions)

Is it safe?

Is it legal?

Is it the right thing to do?

Is it just, balanced, and fair?

How will it make me feel about myself\*?

If something terrible happened, could I defend my actions?

Does this choice lead to the greatest good for the greatest number?

## Final Thoughts

- Read carefully the code of ethics of your profession, better yet, memorize it!
- Never disclose information given to you in confidence, unless it violates ethical codes
- Assume responsibilities\* of your mistakes
- Never accept gifts that compromise your ability to perform with freedom
- Start applying (no plagiarism, no software pirating, no abuse of office resources,...)

***"Indeed the most honorable of you in the sight of God is the most righteous."***

*Chapter 49, Verse 13*

