Engineering Ethics II

- Resolving Ethical Dilemmas

Previously (Ethics I class)

- Engineers impact people.
- the power to impact society comes with the **responsibility** to do so in the public's best interest.
- **Engineer's role** is to represent society and to ensure their safety and well-being.
- **The rules of engineers' roles** for public good are the set of values formulated as ethical codes.

- Example:

NSPE® NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Champion | Guide | Advance | Unite

NATIONAL SOCIETY OF BLACK ENGINEERS

HOWARD UNIVERSITY

Students • Faculty / Staff • Parents / Visitors • Alumni

Academic Code of Student Conduct

IEEE

Advancing Technology for Humanity

Then in Ethics I class, we wrote an Essay

- **Consequences of unethical behavior** in Takata Airbag Scandal

1. What and when did this scandal happen?
2. What was root cause of the scandal?
3. What specific code of ethics was violated?
4. What's the consequence of the unethical behavior?
5. How would you do if you're working for the company as an engineer?

The focus of Ethics II class

- Some ethical dilemmas have clear courses of action for their resolution.
- However, most ethical dilemmas are difficult to resolve

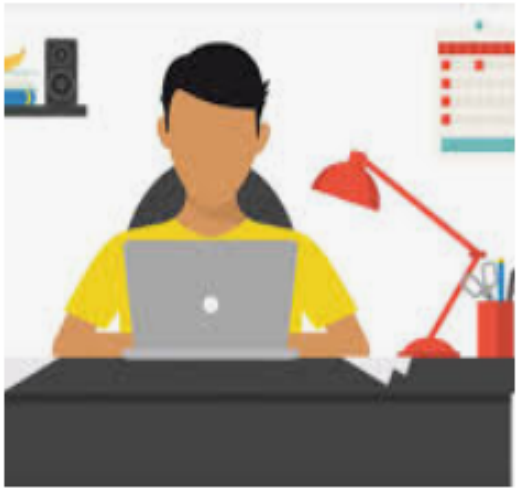
If engineers know that a contact lens they designs will harm the user's eyes

If a software engineer is asked to design a bridge and he has no experience or education qualifying him to do so.

A software engineer used weak security techniques to protect customer information at a bank in order to reduce cost and meet budget.

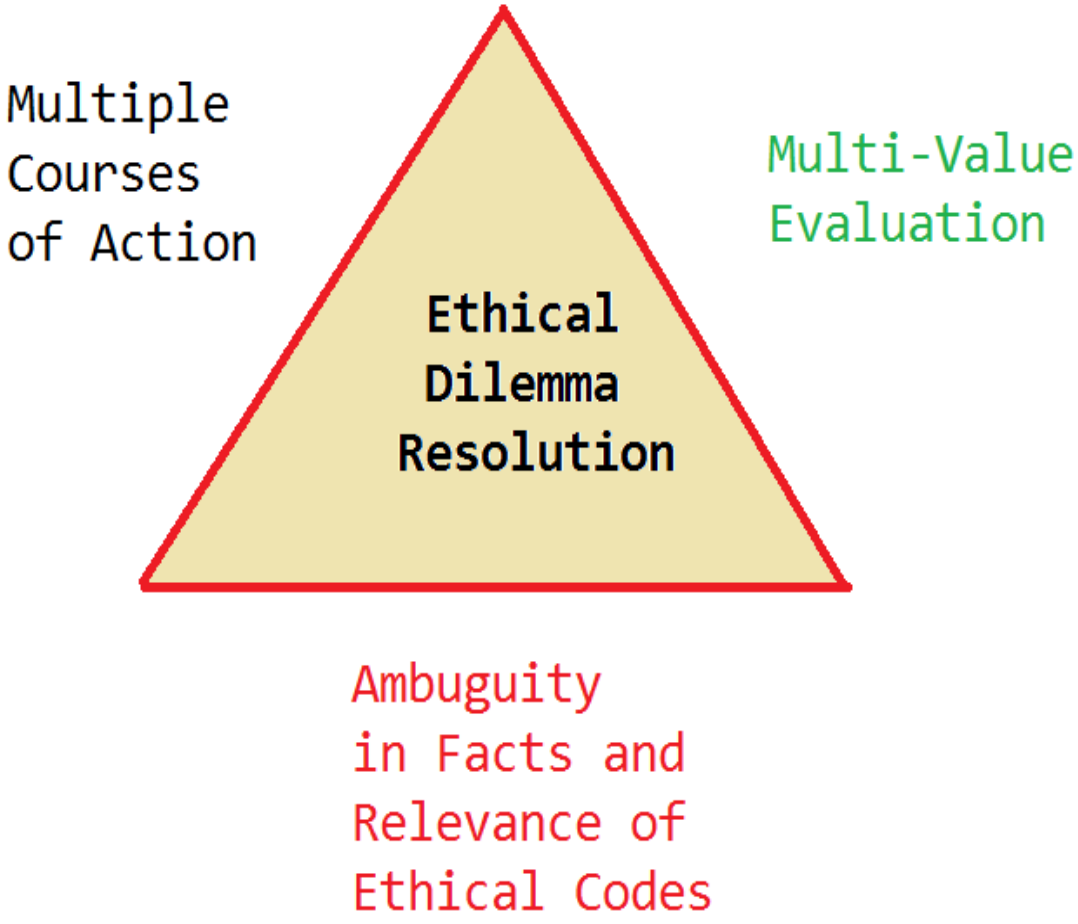
Your company got the big contract but, in order to close the deal, the management had to claim you could perform certain analysis that you don't have the expertise to do. At the same time, the future of your company and its 40 employees ride on this one contract.

An engineer runs some "extra" tests that go beyond those specified by the design requirements of the software she has designed. In doing so, she finds a major flaw that she would never find using only the agreed-upon tests.



A salesperson offers to take an engineer to lunch.

Ethical Dilemmas – Why difficult to resolve?



The focus of Ethics II class

- When an appropriate, ethical course of action is unclear, engineers need a reliable process to guide decisions
- Engineers need to know what to do to find the action that best meets the responsibilities.

6 Steps for Resolving Ethical Dilemmas

step 0: Identify the ethical dilemma

step 1: Determine the facts

step 2: Determine the stakeholders, their interest & identify relevant parts of ethical codes

step 3: Generate several solutions to the dilemmas

step 4: Analyze the proposed solutions

step 5: Select the most preferred course of action

Step 0: Identify the Ethical Dilemma

Are you saying/thinking this?

"Well, maybe just this one ..."

"No one will ever know ..."

"It doesn't matter how it gets done as long as it gets done."

"Everyone does it."

"No one will get hurt."

"It's legal, so who cares?"

A sample Case

- An engineer was working on a team designing a new glucose-level monitor for diabetics. The new monitor was similar to previous models in that a user pricks his finger, puts a drop of blood on a test strip, and then inserts the test strip into the monitor for results. The advantage of the new monitor is that it uses a specially coated test strip to significantly speed up the process. The product had been designed, prototypes had been built and tested, and a manufacturing facility had been prepared. With 10,000 monitors ready to be shipped, the design team finished their final set of testing, which involves having test subjects use the monitor in the field (not i a lab setting). This final test was not required by the FDA, but it was performed because the company took pride in the quality of its products. Going beyond minimum standards was expected by this company.
- During the final field test, some test subjects somehow used old test strips and used them in the new monitor. When the old test strips were used, the resulting glucose level shown on the new monitor was consistently lower than the new strips were used. Upon further testing, the engineers found that a person could have dangerously high glucose levels when the monitor would indicate that the results were only moderately high (when old test strips were used). Moderately high glucose levels showed as normal levels.
- "We don't have to report this – it already passed FDA approval." Such a thought is a beacon calling out "This is an ethical dilemma !!!"

FDA

Step 1: Determine the Facts

- The monitor passed FDA standards
- The additional tests showed that, when old test strips are used in the new monitor, glucose measurements are lower than actual glucose levels
- The error in the glucose measurement could cause people to think they are fine when in fact their levels are too high
- 10,000 monitors have already been produced and are ready for shipping

step 2: Determine the stakeholders- impact, their interest & identify the relevant parts of ethical codes

(a) Stakeholders
(b) Interests of stakeholders
(c) Impact to the stakeholders
(d) Relevant ethical codes

(a) Stakeholders

1. customers
2. Engineering Team
3. Supervisor
4. Employees of the company
5. Stockholders of the company
6. FDA

(b) Interests

- Engineering Team:
  - Develop a product that meets all the design requirements
  - Make device useful for customers and reliable and easy to use
  - Generate income for the company
- Supervisor
  - Develop a product under budget and on time
- Customers
  - Measure their glucose level accurately, quickly, inexpensively, and with little interruption in their lives
- Employees of the Company
  - Make profit for the company
  - Receive reliable income/salary from the company
- Stockholders of the Company
  - Increase the value of the company
  - Keep the reputation high
  - Increase stock price
- FDA
  - Keep customers healthy and safe
  - make sure approval process is strict and accurate
  - Make sure the approved device keeps and maintains its standard

- 2(c) Impacts

2(d) What parts of ethical codes are involved (NSPE code)

- "the health and the safety of the public"
- "acting as a faithful agent to your employer"
- "reporting objectively and truthfully"
- "keep accurate and complete records"

Step 3: Generate Several Solutions to the Dilemma

Options

Record the data internally, but never tell your supervisor, customers, or the FDA

Inform your supervisor and report the results, but don't present any suggestions as to what to do

Inform your supervisor and include several option about how to resolve the dilemma

Propose a design change to the monitor that will resolve the issue such as (a) **putting a warning label that only certain test strips should be used or** (b) **Change the monitor so that only new test strips can fit in the monitor** or (c) rewriting the software in the monitor to detect which type of strip is inserted thereby allowing the correct results to be displayed

Go straight to the local media and tell them what is happening

Destroy all data from the extra tests

Step 4:Analyze the Options

Option 1: Record the data internally, but never tell your supervisor, customers, or the FDA

Option 2: Putting a warning label that only certain test strips should be used

Option 3: Change the monitor so that only new test strips can fit in the monitor

Option 4: Destroy all data from the extra tests

(a) How each option addresses the relevant ethical codes

	Option 1	Option 2	Option 3	Option 4
the health and the safety of the public	No	Yes	Yes	No
acting as a faithful agent to your employer	No	Yes	Yes	No
reporting objectively and truthfully	No	Yes	Yes	No
keep accurate and complete records	Yes	Yes	Yes	No

(b) What are the cosequences on the stakeholders of taking each action ?

Option 1: Record the data internally, but never tell your supervisor, customers, or the FDA

Option 2: Putting a warning label that only certain test strips should be used

Option 3: Change the monitor so that only new test strips can fit in the monitor

Option 4: Destroy all data from the extra tests

Consequence	Option 1	Option 2	Option 3	Option 4
Customers will use old test strips with the new monitor	Very High	High	Very Low	Very High
Customers will be injured as a result of the flaw	High	High	Very Low	High
Company will lose money in the short term	Very Low	Low	Very High	Very Low
Engineers involved will lose their jobs	High	Low	Very Low	Very High
Company's reputation will be hurt in the long term	High	High	Very Low	Very High

Step 5: Select the most preferred Course of Action

- A decision must be made
- The involved engineers should review the 2 tables generated, weigh the trade-offs of selecting each option, and choose an option that best meets their needs and interests.
- Documentation of why one alternative is selected over another is critical – such documentation can prove that they did their best to make an ethical decision under uncertain conditions even if the end result is not ideal.

A final check before taking the selected course of action – consider the following questions

- Are my actions legal?
- Am I being fair and honest?
- Will my action stand the test of time?
- How will I feel about myself afterward?
- How would it look in the newspaper?
- Will I sleep soundly tonight?
- What should I tell a child to do?
- How would I feel if my family, friends, and neighbors knew what I was doing?

Assignment – Individual

- Ethical Dilemma Resolution – following the 6 steps
- For the given scenario, write a report on your final action following the 6 steps discussed in the lecture. Your report should include all 6 steps from 0 to 5 with the final selected option of taking action.

- As for relevant ethical code, use NSPE codes which were discussed in the Engineering Ethics I lecture
- Report Format:
  - Printed document
  - No specific format
  - Check webpage for further details
- Submission Due
  - Check Webpage for details

Assignment (Scenario)

- High Concept Manufacturing (HCM) has an engineering plant in a small town that employs 10% of the community. It provides approximately $10 million of salaries to its workers and pays $2 million in taxes. The HCM plant releases, as a consequence of its manufacturing procedures, bad smelling fumes, annoying residential neighbors and hurting the local tourism trade. The fumes have been linked (although not conclusively) to a rise in asthma in the area. The town is considering an ultimatum to HCM: "Clean up your plant, or we will fine you $1 million." HCM had previously made it known that the business will close down and go somewhere else if it id fined by the town. There will be a town meeting where all concerned parties have agreed to attend and discuss the matters given. You are an engineer living in the town who has been recently offered an excellent job opportunity at HCM. You have signed a contract with HCM, and you are officially one of the new employees. However, this is as of yet not public knowledge. HCM asks you to try to convince the town to drop the case and that the town is better off with HCM's presence. What are you going to do?

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[1] This scenario is adapted from *Engineering Design Process* (by Y. Haik and T. M. Shamin), 2nd edition, Cenage Learning.