

Engr 185 (Engineering Ethics) Notes

Lecture Notes

4/3 - Week 1

- Jon will focus on Ethics (microethics) and Don will focus on Ethics in Engineering.
- 2 Essays and a Team Project and a Midterm/Final which are 100 points each.
- Microethics focuses on the decisions that you as an engineer have control over.
- Macroethics focuses on the big picture decisions.
- What the investment is and what the return is is critical to your product.
- Educate the investor on the culture and background of your company and your problem space.
- The Code of Ethics for the National Society of Professional Engineers says that we should hold the safety, health, and welfare of the public as paramount. We should be truthful, work in area of expertise, avoid deceptive acts, and conduct ourselves honorably, responsibly, ethically, and lawfully.
- The Royal Academy says that we should emphasize accuracy/rigor, and honesty/integrity and respect for life/law/public good and responsible leadership which includes listening and informing.
- If a mistake is caught before exiting the walls of the company, it might not be an ethical violation. If it is external and it impacts lives then it is a violation probably.
- L.A Lights contained mercury switches, CSI kit and Claire's contained tremolite, Mars Climate Orbiter failed b/c of conversion failure.
- Fastest rate of growth for an engineer will come from teamwork, communication, agility, commitment, and organization.
- Common ethics violations include Apple/Samsung IP battles, Theranos, Volkswagen, and Takata Airbags.
- An ethics violation can also include a misleading claim. This falls under deceptive acts.
- The Unmet Need is something that a customer wants and is not currently being addressed.

4/5 - Week 1

- Ethics are beliefs, assumptions, values, and morals.
 - Biologically driven to some level of ethical conduct.
- Sources of ethics could be biological, natural, revelation (religion), philosophical, societal, and cultural.
- John Locke though, thought that we're born into the world without this stuff and that we learn it.
- Ethical progression
 - Royal Legal Codes
 - Revealed Moral Codes

- Specialized Life Codes
 - Ethical Philosophies
 - Societal Regulations and Laws
- Society will try to figure out what people should or shouldn't do, and then philosophers try to decide the principles.
- Problem with the golden rule is not knowing what is hateful or desirable to others?
 - Have to learn through experience and then extrapolate.
 - At the practical level, have to assume homogeneity, cover the big things, and empathize.
 - At a conceptual level, learn/share/refine your cognitive models
- Code of Engineering Profession says that engineers should hold the safety and health and welfare of the public at paramount.
 - But how do you know what's paramount and that you're protecting public safety?
- Ethics is in between a society's moral and its laws.
- Moral and ethics often become laws when public support is high enough.
- With enough public support, laws can be overruled or can come to be.
- Difficult ethical problems lie inside of the boundary of what is legal.
- Things that were formally ethical questions are now outside the law.
- John Locke and Rights Ethics said that human rights are basic and you're born with them.
- Rights Ethics are brought up when you're interacting with a government agency like NASA or something. Cannot be brought up when dealing with FB or corporations.
- There are rights that are in opposition.
 - Right to bear arms vs right to safety and protection
 - Right to freedom of speech vs right to a non-hostile environment.
 - Right to choose abortion vs right of the fetus to live.
- Duty Ethics emphasize what we owe to others and are concerned with our basic duties.
 - "Should what I'm doing be okay for everyone in the world to do"
 - Basic decency to other people
- Virtue Ethics are geared toward trying to be like a certain person.
- Utilitarianism says you want to have the most good for the most people, but doesn't take into account who and how much people get hurt.
- Research Ethics say that honest mistakes are tolerated but falsification of data is not.

4/10 - Week 2

- Price performance chart is a way to quantify the unmet need.
- When thinking about attributes, need to think of things that are distinct among products. For example, if all the products are light, then weight isn't a useful attribute.
- Patent is made up of an abstract, specification, and claim.
 - Claim is legal definition of what they own

4/11 - Week 2

- Normative ethics normalizes behavior and then we decide whether or not something is ethical or not according to a definition.
 - This is what we are talking about.
 - No space for personal opinion here.
- Point of normative ethics is to give engineers a framework for them to decide whether to build something or not.
- Ethical frameworks
 - Ethics vs morality
 - Ethics is a systematic reflection on morality so it seeks to define what is moral and not moral. Ethics are usually defined by an outside party.
 - Descriptive ethics seeks to define what is acceptable and what is not. “Trying to figure out what is acceptable. That’s what you talk about in philosophy”
 - Normative refers to how you should act, and it judges and forms recommendations. “This is what it is. That’s not okay, this is okay”
 - Morality is the accepted rules of behavior defined by whatever you’re in. A moral behavior could be cannibalism for some tribes in Africa for example.
 - Values, Norms, and Virtues
 - Norms are rules that state whether an action is required, permitted, or forbidden.
 - Ex) Kids have to clean their rooms, You have to stop at a red light
 - Most are laws
 - Values help us determine which goals are worth striving for.
 - Ex) If you do value education, then you strive for higher education. Freedom is something America values, so that’s why we kicked out dictators and that’s ethical to us.
 - These can be intrinsic (wants _ just for the sake of having _) or extrinsic (wants _ because of what _ can do). If you think of money in both cases, both people are valuing money.
 - Virtues are character traits that create or define ethical action.
 - Ex) If you’re wise, then you’re likely to make good ethical choices.
 - Other examples
 - Virtues are things that you have, while a value is something that deem is important. Something can be both a value and a virtue.
 - Extreme Theories
 - Normative relativism: All moral points of view are relative. “Whether you have a Christian moral view or some other moral view, it’s all relative and there is no right or wrong. Basically, you have your own truths, there’s nothing that is right or wrong for everyone”
 - Absolutism: Only one right morality. “Thou shalt not kill”. “It’s always wrong to kill someone regardless of circumstance. A rule is a rule and there is absolutely no breaking it. ”

- Primary Theories
 - Consequentialism: Use values to make the decision based of the consequences of your action. “Means to an end people. All is well that ends well. It’s ethical and cool if I break a shit ton of traffic laws but I get to the end safely and nobody was hurt”.
 - One example is Utilitarianism.
 - Deontology/ Duty Ethics: Use norms to make the decision based on the action. “Just do your duty. ”
 - Virtue Ethics: Use virtues to make the decision based off the person/company. “Company shows or doesn’t show that they are a safe or not safe company”. “We’re talking about whether the person is ethical, not necessarily their actions”

4/12 - Week 2

- Feedback loops key to engineering ethics. If anything goes wrong in the straight line process, you should add a feedback loop.
- With the O-ring NASA incident (Space Shuttle Challenger), the engineers knew about the problem, but the higher ups didn’t deal with it.
 - The O-ring became really brittle in the cold conditions and stopped working. They could have just been able to put a heating device there or something.
- In the Columbia launch, it looked like there was a piece of debris and got dislodged and was going to hit the wing, but those wings weren’t built to withstand that type of impact. They could only withstand 0.005 ft * lb. Again, this was another case of NASA management didn’t take the engineer’s concerns seriously.
 - One of the lessons is that NASA management needed to be more open to alternatives.
- Therac-25 had a shit ton of problems. There were 6 overdose events from 1985 to 1987 and was recalled afterwards.
 - The problem was with the keyboarding and thus incorrect positioning of some of the components (collimator). There were also some software bugs that caused incorrect dosages to be given.
 - They didn’t have enough testing history or use history for the probabilities for failures that they listed.
 - There was also an 8 second delay with the collimator’s movements.
- Ancure Tube was a way to deal with some artery problem.
 - 1/3 of all the units being used had some sort of failure and none of this was reported to the FDA. Criminal charges were filed against the company.
 - Would have been more successful if they had been open with the FDA. They originally were, but stopped being after they were acquired by another company.
- Ventak Prizm is an embedded defibrillator but it had the possibility of leaking. The device could short out positively and pump 300 volts to your heart but negatively shorting out wouldn’t do anything.

- Didn't tell anyone because the risk of replacing it is higher than keeping it there. Thus, there was false reporting to the FDA.
- Doesn't that decision need to be taken by the patient and not by the company right?

4/17 - Week 3

- DC-10 is the case study today.
- Management should set a culture that allows bad news to get up to management. Management also wants to be able to hear it and then do something about it.
- No regulations on flying wide body aircrafts at the time since it was 1960s
- DC-10 was about twice as long as the DC-9. Thus, you have 8 times the amount of air inside of the cabin. That baseport won't be long and large enough to equilibrate fast enough.
 - Douglas doesn't change it, and the planes were only able to handle twice the amount of air.
- Plug doors are normally used on planes (inward opening) but people wanted outward opening doors so that you can fit more in the cargo section. Boeing had a good teeth solution, but Douglas didn't.
- Cargo handler shoves the door home, the rod bends, the plate isn't in place, and the rear cargo door blows out during the flight, and then the floor collapses. 346 dead after this crash.
- Douglas failed to go beyond FAA design regulations, failed to design for air pressure equalization, ignored Dutch FAA input, forces electrical door closer against Convair's recommendations, and Douglass censors FMECA, failed to respond to Long Beach blowout.
- No redundancy of electric power to the stick shaker in order to try to save cash. Thus, pilots didn't know that they lost an engine or had asymmetrical slats.
- One of the mistakes made here is that they didn't account for the fact that failures are not independent of each other.
- Other case studies today
 - https://en.wikipedia.org/wiki/Turkish_Airlines_Flight_981 Paris flight
 - Cargo door broke off causing decompression and collapsed floor
 - https://en.wikipedia.org/wiki/American_Airlines_Flight_191 Chicago flight
 - Engine separation and then severing of the hydraulic lines.
 - https://en.wikipedia.org/wiki/Japan_Airlines_Flight_123 Japan flight
 - Improper tail construction and then decompression
 - https://en.wikipedia.org/wiki/United_Airlines_Flight_232 Sioux City flight
 - Failure of engine causing loss of control
- The Sioux City crash was unique because the people there were ready to help medically. The crash was due to an emergency hydraulic valve that wasn't put in by Douglas.

- Douglas was constantly comprising the integrity of this aircraft, and didn't do enough even in the face of failure.
- Douglas also only had 3 hydraulic lines, while Lockheed and Boeing had 4.
- Douglas cut a lot of corners because they were trying to get their plane out faster and they had competition from Boeing and Lockheed.
- Whistle blowing is defined as reporting ethical violations against the wishes of the employer.
- When should you whistleblow though?
 - Definitely when lives are at risk or there is a sense of personal moral outrage.
- This can be somewhat dangerous, though, especially when it comes to how you report the violation and who you report it to. Your job and reputation could be on the line.
- Don was a whistleblower on two occasions
 - One to report info on a sexual assault perpetrator applying to be assistant dean.
 - The other was to turn in a phony doctor.

4/18 - Week 3

- During revision:
 - Does the essay follow the assignment?
 - Is there a controlling focus in the form of a thesis?
 - Are the ideas strongly developed? Really need to drill every point you want to make home.
 - Is there an overall structure?
 - Are the paragraphs structured carefully and well developed?
 - Is there sufficient specific support to develop the ideas?
 - Are the sentences clean, effective, and error free?
 - Are there patterns of error that should be addressed?

4/19 - Week 3

- Shift from "Autopilot" to "Driver Assistance" makes a big difference in the minds of the user.
- The choice to use Autopilot might be the user's decision, but if you offer something called Autopilot, then is that misleading? What type of safety do you have to ensure? Can that level ever really be reached?
- Concept of Ops revolves around your POV as the customer and what they want.
 - Used to communicate how the customer wants to use your product. Then R and D will be involved to estimate the project scope and whether it is feasible.
- ConOps example
 - Ability to tune a guitar quickly and accurately
 - Basically all the things that a customer wants
 - Also add the process of installing and using the product
- Validation is assurance that product, service, or system meets the needs of the customer.

- Verification is the process of checking whether the system meets the specification.
- Biggest chance of seeing an ethics violation is when your product doesn't meet specifications.
- Engineering is responsible for meeting the specifications and Quality is expected to make sure verification.

4/24 - Week 4

- Tool making -> Agricultural -> Industrial
- Population grows because of
 - Agriculture: Animal domestication and crop production
 - Urbanization: Shelter, water, energy, and sanitation/health services
 - Industrialization: Economic growth, food/medical products, and broad distribution
 - Biological: Hospitalization, infection prevention, fertility, and longevity.
- Price of natural gas has dropped significantly because of the introduction of fracking. We thus don't use coal powered plants now.
- Most of water resources go into flood runoff which is not accessible to us.
- We need to use base flow from more remote area, flood runoff resource, and ocean desalination.
- Land resources are insufficient at present yields.
 - Land needs to be acquired by deforestation and/or irrigation.
 - Yields can be increased by biotechnology, but at a cost.
- There is a steep increase in energy consumption over the last century.
- Lots of coal has been used, but coal is a very heavy polluter. We need better coal and alternative energy forms.
- If inflation is taken into account, then the price of gas has stayed relatively constant.
- Energy forms have changed to match society's changing needs and the availability of natural resources.
- For energy, consumption is increasing, but the conventional resources are decreasing.
- Our water use has grown 6x in the last 100, versus a 2x growth of population.
 - Agriculture uses 70% of that
 - There is still a huge problem with human consumption because of inadequate drinking supplies. 40% of the world faces drinking water shortage. A billion people lack access to safe drinking water. 2.2 million die because of contaminated water
- Capacity to produce food is nearing the limits.
- Developing countries eat 2100 to 2700 cal/day while 3000 to 3400 cal/day in industrial countries.
- Resource Impact = PAT (Population x Affluence x Technology)
 - This is the quantity that a particular country for its impact.
 - US has 5% population and 25% impact.

- What happens when other countries want the same first world benefits. We need to start cutting back because other countries want what we have.
- Individual resource use is also disproportional in the US. We have huge energy consumption per capita.
 - One reason is because everything is hella compact in Europe. All the population is in the cities and you don't have the suburbs that we have here. That is what contributes to longer drive times to work and thus more energy use.
- 20/60/20 split between lower, middle, and consumer class.
- For midterm, study slides and the quiz answers. Stress the British code, accuracy, and rigor. Ethics is a continuum. Price performance chart. Study textbook chapters 1-5 and know the definitions. Focus on what people did right or wrong in the case studies. Know the ethical frameworks as well as the bio accidents and the DC 10 accidents.
- If Gov. Agency is involved in an ethical case study, the first framework you want to look at is a violation of rights ethics.
 - Positive affirmation of rights ethics is traffic system
 - Negative affirmation of rights ethics is NSA collecting phone numbers (for some people). Also speed traps (trying to catch people for very very minor speeding), because you're ultimately hurting the people.
- Vespa was a small motorbike that gets 75+ mpg.
- We have a huge ecological footprint in the USA. To extend that footprint to everyone on Earth would require 3-4 Earths.
 - Increasing population, affluence, and needs/wants are barriers to lowering this.
- The shared commons that are in danger include fossil fuels, mineral ores, topsoil, water, forests, atmosphere, oceans/coral reefs, wilderness, and species.
 - In the 3rd world, we're tearing down the forests and not replenishing them.
- Some new concepts we've been thinking of lately are viewing the ecosystem as a whole, having finite limits on resources, ecological stability, and ecological sustainability.
- We have to look at things in relation to each other. An example is looking at the whole forest ecosystem vs looking at just a particular species.
- To understand what is happening in the environment, we use sensors, data processing, computer models, prediction, communication, and publication.
- The roles of engineers lie in analysis through measuring current situation, predicting future, and developing new tech. They have to create new strategies for a sustainable environment. Also, they have to communicate to policy makers and to the non-technical public.

4/25 - Week 4

- Elements of clear and concise writing
 - Too much detail is not good
 - Know what you want to say
 - No repetition with adverbs and adjectives.

- No SAT vocab show, just try to get your point across
- Use parallelism which is where you use the same tenses and subjects/pronouns.
- If it's not adding anything to the paper, then you should get rid of it.
- Too many transition words is not good, only use when you need them.
- To deal with wordy essays,
 - Sentence by Sentence
 - Paragraph by paragraph: Reverse outline based on whatever your paper currently is.
- You don't want to insert yourself into the paper, because the evidence should be enough by itself.
- The more straightforward you can make a sentence, without needing to section the sentence into different parts using commas, the better.
- Conclusion: You want to give a Sparknotes version that trigger thoughts that were went over in the actual body of the essay. There shouldn't be any new information in the conclusion
 1. Restate thesis
 2. Restate main points
 - a. Problem Statement
 - b. Hardin
 - c. Tech. solutions
 - d. Appeal to conscience
 - e. Nontech solutions
 3. Universal connection: Try to connect back to the first statement in the problem statement.
- Paragraph: Collection of related ideas
 - Have one unifying idea, topic sentence, that is related to the thesis.
 - Important components to have are:
 - Unity: All information relates to one topic or one topic of discussion
 - Coherence: Flows logically and transitions are used to help this. Coherence helps understanding for the reader.
 - An advanced form of transition gives a summary of the previous paragraph and then moving into a contrast with the current paragraph.
 - Topic sentence: Main point of the paragraph. Every single other sentence in the paragraph will relate back to it. It also has to clearly relate back to your thesis.
 - Development: Refers to the actual content of the paragraph. We can put in examples, data, causes, and reasons. This is the part where we prove to the reader of the point you want to make.
 - Parallel Structure: Making sure that everything stays in the same order and everything gets equal weight.
- Things to work on
 - Making sentences more concise

- Ways to make a good conclusion
- Utilitarianism is a form of consequentialism (when deciding if something is ethical or not, you're only looking at the quantitative consequences of the action).
 - Jeremy Bentham created the **utility principle** which says that we should want the greatest happiness for the greatest number of people. That can be in the form of a cost benefit analysis where a company may have a patient die, but they could say that the extra money it would have cost to fix it would have ended up saving less lives. He also defined happiness as pleasure, and this is called hedonism.
 - John Stuart Mill believed that there are higher and lower desires (love > sex). Certain things are more worthwhile to obtain than other things. He also said the problem with utilitarianism is that if you cater to the majority, then you're only catering to straight white males, and this could cause exploitation of minorities.
 - **Freedom principle** says that you're free to find pleasure as long as you don't inhibit the pleasure of others.
 - **No harm principle** is the same as the above except it's concerned with physical safety instead of pleasure.
 - Criticism is that happiness cannot be measured quantitatively, this exploits minorities, distinctive justice (you cannot really have a balanced life without considering income, happiness, etc), that consequences cannot be foreseen, ignores personal relationships, and some actions are morally acceptable + don't cause pleasure, and vice versa.
 - Everything above is called act utilitarianism because it is looking at the actions. Rule utilitarianism recognizes the existence of moral rules.
- Duty ethics is deciding whether something is ethical by looking at an action and comparing it against certain rules. Immanuel Kant created the following below:
 - An action is right if it is in agreement with a moral rule. These moral rules cannot be based on happiness. There is also an emphasis on autonomy in that people have the ability to reason for themselves about whether something is moral or not. Because they do have this ability to decide what is correct, they should be able to use it. Good will refers to actions that are led by the moral norm are unconditionally good.
 - 1st categorical imperative (aka universality principle) says that you should only act on the maxim that you can, at the same time, will that it will become a universal law.
 - "All actions need to be based on the principle that if you apply your rule to everyone, then everything will still be okay."
 - 2nd categorical imperative (aka reciprocity principle) says that you should treat people as an ends, not a means only. People should also have the right to make up their own mind and exercise their own autonomy.
 - "The people are important to you, not the things that the people can provide for you"

- If you don't give people all the info that is available, then you're not being ethical to them because they don't have autonomy.
 - This is not the Golden Rule
- Equality postulate says that persons are treated with equal concern and respect. When making decisions of whether something is ethical, it doesn't matter what their status is.
- Criticisms include a rigid adherence to moral norms which makes people blind to the negative effects of their actions. This creates less ethical people because they don't think about ethics when they make decisions, they just look at the rules. There are also contradictory norms which are divided into two. Prima facie norms are what seems good at first. Self evident norms are second level norms
 - "One rule says that I should turn this person in, but the second rule says that I should be a good friend"
- Virtue Ethics is something Aristotle came up with. It refers to when you feel bad/tired but you feel accomplished about your actions. This does not refer to pleasure (not the feeling of short term pleasure), but more about the state of being a good person.
 - Moral virtue is the middle between 2 extremes of evil.
 - For example, we are either cowardly or reckless, but the middle ground is being courageous.

This is developed through good deeds. Virtue is the ability to choose right and pursue the virtue that is between two vices.
 - Criticism is that it's not really clear about what to do in particular situations. It's really abstract. We want to be courageous but there are no concrete clues as to what that looks like. The counter to that is if you have the right virtues, that means you'll make the responsible action. Another criticism is that it's not really different than duty ethics because you're thinking about what action will make you courageous which focuses on the action itself which is similar to duty ethics.
 - This is all about making decisions that reflect the type of person that you want to be.

4/26 - Week 4

- As you go on with the project, you still want to be able to meet the unmet need but you could make changes to the actual implementation.
- Similitude is where you're experimenting by scaling up or down in size and by changing the parameters.
- Theory of operation refers to all the interactions between different components in your system.
- If every competitor does the same thing, then it's not a key attribute

5/1 - Week 5

- We should take care of the environment because it affects how human beings live today, the lives of future humans, and the lives of future species.

- LA smog problem exacerbated by the inversion layer.
- Federal gov is the one that can regulate automobiles, not the local or state governments.
- Vapors coming off of an oil based paint are a lot, so we use water based paint.
- CFCs will attack the ozone layer and this is what reduces the layer.
- We've tried to make the shift from CFCs to HFCs.
 - This helped address the growing ozone hole problem, but it is now contributing more to human caused climate change through greenhouse gases.
- Currently no real controls over automobiles in today's world.
- Potential effects of the global temperature rising is the heating of oceans and melting of polar ice and glaciers. You could have a rise in ocean levels and a loss of coastal lands.
- Earth actually cools several degrees after a major volcanic explosion because the sulfur and oxides that come from the volcano help reflect incoming solar radiation.
- US and China account for a third of the world's carbon emissions.
- Fracking water gets dumped into existing oil wells, but this apparently causes earthquakes.

5/2 - Week 5

- Deontology (Duty Ethics) - Ford Pinto
 - Values would be human life and safety.
 - Violated by 2nd imperative, because people didn't know the risk.
 - Another value is money
 - Passes 1st imperative because we should value money and cost effectiveness, but this doesn't pass 2nd imperative
- Virtue Ethics - Ford Pinto. Here are the 4 virtues that Ford didn't have when it comes
 - 1. Transparency: Didn't disclose risk
 - 2. Concern: Didn't care about consumer safety
 - 3. Responsibility:
 - 4. Reliability:
- Utilitarianism: - Ford Pinto
 - Cost benefit analysis is passed in this case.
- In the Pinto case, you can look at different ethical frameworks and actions can be ethical in some frameworks and not in others.
- Don't say "You have a duty to ____" if you're using the duty ethics framework.
- Cannot use deontology in the cheating example because you would always be breaking the rules of the school.
- With utilitarianism, you do the cost/benefit of a particular value.
- Deontology is all about following the rules.
- Bjork Shiley Heart Valve
- In reciprocity principle, people should have info to make informed decision
- First imperative: Determine the action, look at the action, ask yourself can it be made into a universal law.

- When looking at cost benefit, it's not just about money, it's about looking at costs as in human costs, emotional costs, etc.

5/3 - Week 5

- Left hand side of specifications is the customer need and the right side is the engineering details.
- FMECA comes down to looking at your product and asking what is the worst thing that can happen.
 - Number 1 source of ethics violations.
- With FMECA, you're looking at possible damage to human life.
- Protection of the public should be the highest priority for the The Board.
- The Board has 8 public members and 7 practitioners.
- To achieve the professional license, you need education, work experience, and passing the appropriate examinations.
- FE exam is 6 hours, and PE is 8 hours.

5/15 - Week 7

- Reputation repair on the internet is difficult since once it's there, then it's almost impossible to get all the links removed.
 - Can do that somewhat in Europe, but not the in US.
- UC Davis used the reputation repair service to try to bury the results of police brutality against protesters.
- Chances for abuse of info come from privacy (adding to database without permission) as well as piracy (taking from database without permission).
- Significant overlap between data acquisition and surveillance.
 - Acquisition: Info acquired on population in course of normal activities.
 - Surveillance: Info acquired on selected individuals for a specifically defined purpose.
- In Internet age, we don't know what is privacy.
- For example, with your home, police can enter, search, and seize with a warrant. Without a warrant, police can't check infrared, drug sniffing dogs, wall piercing radar, etc.
- Public has to decide how intrusive we want the government to be when dealing with these security issues in our country.
- Individuals have rights to be secure in their persons and society has a right to be secure by analysis of information. Government has duty to preserve both rights and security.
- Group Project Stuff
 - Introduction/Unmet Need
 - Key Attributes
 - In depth on competitors
 - ConOps
 - Major subsystems (Talk about what the main parts of the product are)
 - Specifications
 - Proof of Concept (Any product design specs)
 - Mitigation of Risk
 - FMECA

- Financial Summary (BOM and Break even point calc)
- Project Plan
- Conclusion

5/17 - Week 7

- FMECA is a way to protect yourself as an engineer.
- People who you work with and the manager determine the culture.
- Risk and mitigation is what can derail your product.

5/22 - Week 8

- Naturalistic Decision Making is like gut decisions and depends mostly on your quick instincts.
- Analytical Decision Making relies on adding an analysis test or decision analysis that goes over relevant questions, like “Is cost of error high” or “Is situation unfamiliar”
- Risk analysis involves hazard identification, hazard and scenario analysis, and the ultimate risk.
 - That risk depends on the likelihood and the consequences.
- Safety barriers are things that prevent safety failures from occurring.

5/29 - Week 9

- Ford Pinto problem was that in a rear end collision, gas tank comes loose, and causes gas leaks, explosions, and deaths.
- Car had a very weak rear end in terms of the amount of steel. The goal was that the car had to be under 2000 pounds and 2000 dollars, and so this was preferred over the steel included for safety.
- To get the car on the road, they shortened the development period of 43 weeks to 25 weeks.
- Another Ford car that had issues was the Explorer SUV where the issue between safety vs schedule and cost.
- They wanted to rapidly enter the growing SUV market and they cut the design time by reengineering an existing product. They used the chassis of a pickup truck line. This created a situation where the car’s center of gravity is higher and thus the vehicle is more likely to flip over.
- There was a 1996 partial redesign

5/30 - Week 9

- PPT Tips
 - Don’t put too much text on the page
 - Font size matters. Use Arial or Calibri.
 - Keep text stationary
 - Avoid excessive bullet points because the key points won’t stand out.
 - Have uniformity in your slides

- Commandments of Visual Aids
 - Each one must enhance, support, and facilitate understanding of material covered in your slide.
 - All visual info must be brief and concise.
 - Visual aids must be legible and clearly visible to the entire audience.
 - Two or three facts per image are best. Aim for 1 minute per slide.
 - Don't load too many visuals into a talk.
 - Use color for emphasis, distinction, and clarity.
- Tips for better slide decks
 - Think about your slides last. Think first about what you want to convey to the audience.
 - Create a consistent look and feel. Each slide is part of the same story.
 - Think about topic transitions, and figure out how you're switching the slide.
 - With text, less is almost always more.
 - Use photos that enhance meaning.
 - Write down all of our names on the bottom left.

Textbook Notes

Chapter 1 - The Responsibilities of Engineers

- Inadequate communication at NASA is what caused the Challenger disaster.
- Responsibility means being held accountable for your actions and for the effects of your actions.
 - Active responsibility is responsibility before something has happened, while passive is applicable after something undesirable has happened.
- Role responsibility is the responsibility that is based on the role one has or plays in a situation.
 - Role X may have some responsibilities that conflict with the responsibilities in role Y.
- Moral responsibility is responsibility that is based on moral obligations or duties.
- Professional responsibility is the middle ground where you follow responsibilities based on your role as an engineer in as far it stays within the limits of what is morally allowed.
- Accountability is backward looking responsibility in order to justify one's actions.
- To be blameworthy, there has to be wrong doing, casual contribution, foreseeability, and freedom.
- If someone is actively responsible, we expect them to act in a way that undesired consequences are avoided as much as possible.
- Active responsibility needs perception of threatened violations, consideration of consequences, autonomy, and take role obligations seriously.
- There is a danger in technological enthusiasm where the possible negative effect of tech can be overlooked.

- Effectiveness is the extent to which a goal is achieved and efficiency is the ratio between the goal achieved and the effort required.
- Engineering ideals are technological enthusiasm, effectiveness/efficiency, human welfare.
- Potential conflicts between engineers and managers and conflicts between your role responsibilities as an employee and as an engineer include separatism (scientists/engineers -> technical and management -> value decisions), technocracy (government by experts), and whistle blowing (employee discloses abuses in a company without approval of superiors).
- Tripartite model includes policy makers -> designing engineers -> users.
- Whistle blowing normally forces people to make a lot of big sacrifices.
- Stakeholders are actors that have an interest in the development of a technology but can't influence the direction of tech development.
- Technology Assessment is a way of exploring future tech developments are assessing their potential societal consequences.
 - Wanted to catch the early detection and warning signs for possible negative effects.
- Collingridge dilemma says that it is not possible to predict consequences of tech in the early stages of development and once the negative consequences are seen, it is hard to change the direction of the tech.
 - CTA is a test that works to analyze a project and feed info back into the dev and design process of technology.
- Engineers have two main role responsibilities, one as engineers and the other as employees.

Chapter 2 Codes of Conduct

- Codes of conduct are codes where organizations lay down guidelines for responsible behavior of their members.
 - Professional codes formulated by professional associations of engineers while corporate codes are formulated by companies in which the engineers are employed.
 - Professional describes responsibilities as engineers while corporate describes responsibilities as employees.
- Codes can increase moral awareness, identification of moral norms of a company, stimulate ethical discussion, and increase accountability to outside world.
- Aspirational code expresses moral values of profession or company.
- Advisory code helps professionals exercise moral judgments in concrete situations on basis of more general values of profession or company.
- Disciplinary code says that behavior of all professionals meets certain values and norms.
- All codes include obligation to practice profession with integrity, honesty, and in a competent way.
- Mission statement concisely formulates the strategic objectives of the company.

- Core values express qualities that a company considers desirable.
- Norms and rules contain guidelines for employees on how to act in situations.
- Window dressing is presenting a favorable impression that is not based on facts.
- Uncritical loyalty is placing the interests of the employer above any other considerations while critical loyalty is constraining the previous rules so that we stay within the constraints of the employee's personal and professional life.
- Ethics can't be codified because ethics requires individual moral judgment, codes of conduct are not morally binding, and that the codes shouldn't presuppose that morality can be expressed in a set of universal moral rules.
- Companies can try to impose confidentiality duties to protect competition.
- External auditing is assessing a company in terms of its code of conduct by an external organization.
- Codes of conduct not great because they amount to window dressing, they are vague and contradictory, ethics can't be codified, the codes can't be lived by, and they are not enforced.

Chapter 3 - Normative Ethics

- Ethics provide a normative framework for understanding and responding to moral problems.
- Ethics is the systematic reflection on morality.
- Morality is the totality of opinions, decisions, and actions with which people express what they think is good or right.
- Ethics is kind of a process of searching for the right kind of morality.
- Descriptive ethics describes existing morality (including acceptable and not acceptable actions), while normative takes into account morality and tries to formulate normative recommendations about how to act or live.
- Descriptive judgements are related to what actually occurred from a facts point of view.
- Normative judgements are more about whether something is good or bad or right/wrong.
 - These refer to moral norms and values.
- Values help us determine which goals are worth striving for.
 - Have to be strived for in general, regardless of who you are.
- Norms are rules that prescribe what concrete actions are required, permitted, or forbidden.
 - Traffic system is a good example.
- Virtues are a certain type of human characteristic or quality.
- Hedonism says that pleasure is the only good thing that is good in itself and all other things are instrumental.
- Utility principle says that one should choose actions that result in the greatest happiness for the greatest number of people. This is the basis for utilitarianism.
 - However, problem is that we cannot accurately measure happiness and please and that can be different among different people.
 - You also cannot accurately predict what the consequences of actions are.

- There can also be an unjust distribution of costs and benefits.
 - It also ignores the personal relationships between people by treating everyone as an anonymous unit.
- The freedom principle says that everyone is free to strive for their own pleasure, as long as it does not deny or hinder the pleasure of others.
 - Also known as the no harm principle.
- Act utilitarianism judges the consequences of individual acts where rule utilitarianism judges the consequences of the rules on which actions are based.
- Utilitarianism allows for a lot of side effects in favor of just trying to consider overall welfare or happiness. This could lead to an abandonment of principles like “You cannot put a price on someone’s life”.
- Duty ethics says that an action is morally right if it is in agreement with a moral rule.
 - Big thing is that those rules can't be based on happiness.
- Good will is the notion of our actions being led by the moral norm. This is a categorical norm which means that it is unconditionally applicable. A hypothetical norm, though, only applies under certain circumstances.
- Universality principle says that you should only act on the maxim which you can follow unconditionally.
- Equality postulate says to treat persons as equals, with equal concern and respect.
- The criticisms of these theories are whether or not we can really have an unambiguous and consistent system of norms.
- Prima facie norms are those that are applicable unless overruled by more important norms.
- Moral autonomy says you should be able to determine what is morally right through reasoning.
- Care ethics emphasizes the importance of relationships, which means that just learning general moral principles is not enough.
- Virtue ethics deals with virtues, deontology deals with norms, and utilitarianism deals with values.

Chapter 4 - Normative Argumentation

- Purpose of argumentation is to justify or refute a statement.
- An argument is a set of statements, of which a conclusion follows from a set of premises.
 - Conclusion is affirmed based on the other statements.
- Arguments can be analyzed by looking at the rhetorical analysis in whether the argument was persuasive, or from logical analysis in whether the argument is valid.
- With valid arguments, the conclusion of the argument follows with necessity from its premises.
- Antecedent and consequent are the two components of a conditional statement.
- Modus ponens refers to form of valid argument where conclusion q follows from the premise p in the form “if p then q”. Modus tollens denies consequent of the first premise.

- To invalidate an argument, you can try to prove that a premise is false or that a conclusion is premature.
- Valid arguments are deductive in that the conclusion is enclosed in the premises.
 - Adding new premises won't change anything in the logical validity of the conclusion.
- Non-deductive arguments are where conclusion is logically stronger than the premise. In these cases, truth of the premise doesn't guarantee truth of the conclusion.
- Inductive argumentation is where we take the particular knowledge and try to apply in the general case.
- Sound argumentation is where critical questions can be answered positively and thus the conclusion is plausible if the premises are true.
- Argument by analogy is non-deductive and it compares to a situation where moral assessment is clear and the comparison is sufficient.
 - If something was true for the example case, then it's true for the current case.
- Means end argumentation is non-deductive and it is where from a given end, the means are derived to realize that end.
 - "If you wish to achieve end X, then you must do action Y".
- Casualty argumentation relies on the fact that a certain expected consequence can be derived from a certain situation or action.
- Proof from the absurd (deductive) is where a proposition is proved by showing that the negation of the proposition leads to a contradiction.
- Formal fallacies determined by the form or structure of an argument. Invalid arguments are examples. Informal fallacies are based on context and content of the argument. Examples are attack on person, confusion of law and ethics, wishful thinking, etc.
- When thinking about tech risks, there are some fallacies in people thinking about sheer size, fallacy of naturalness, ostrich fallacy (no detectable risk/proof -> no risk), delay fallacy (if we wait then we know more -> can't act now), technocratic (X is engineering issue -> engineers decide whether it's acceptable)

Chapter 5 - The Ethical Cycle

- Ill structured problems are those where there is no definitive formulation of the problem and may only be defined during the process of solving it.
- A problem is thinking that moral problems are well structured, when they are ill structured in reality.
- Ethical cycle wants to improve moral decisions through systematic and thorough analysis of the problem.
- Formulation of moral problem (>2 values can't be realized at the same time) -> problem analysis (find out stakeholders, relevant moral values/facts) -> options for actions (start with black/white strategy, then strategy of cooperation and then whistleblowing) -> ethical (different frameworks) eval of the actions -> reflection.