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Professional and Ethical Issues in Electrical and Computer Engineering

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What is an Ethical Engineer?

Doctor Who, the twelfth Doctor in the series to be exact, once said: "Never be cruel. Never be cowardly. Hate is always foolish. Love is always wise. Always try to be nice, but never fail to be kind" (Talalay). The Doctor was regenerating at this moment, and offering a final lesson in ethics, and in life, to the next doctor to take his place. In this quote, he lists virtues he hopes the next Doctor will take on. In truth, these virtues are ones that all ethical engineers should live by as well. Ethics are an important part of engineering because of the responsibility of the profession and the impact engineers have on many lives. Philosophies like Consequentialism, Deontology, and Virtue Ethics all try to illustrate the best way to live. In the end, an ethical engineer is someone who cares enough to take action, someone who commits their life to growth, and someone who encourages the best out of others. Of the three main ethical philosophies, this matches best with Virtue Ethics.

Consequentialism is the philosophy of ethics where your view on whether a situation is ethical is based solely on the outcomes of your actions. Consequentialism does not take into account any of the actions it takes to achieve the desired outcomes. For example, to refer back to the trolley car problem discussed at the beginning of this course, a consequentialist perspective would always choose to save the greatest number of lives as it has the best outcome of the situation. Consequentialist ethics would not take into consideration who the people were, just the greatest number of people saved. For example, what if one person was your mother on one set of

tracks, but there are two people on the second set. Consequentialism would also pick saving the two people over the one (Fila "Trolley"). One way that consequentialism is seen in the engineering field would be when choosing between different options in an engineering workplace, a consequentialist engineer will choose from the options based on which would give the best outcomes for their project. For example, in class we discussed pizza delivery via three robots. In this activity, we had to choose between an autonomous car, an autonomous drone, and Wall-E. During this discussion, we found that the car was the best outcome from a consequentialist perspective because of its reliability, its high quality to standard, and high capacity for transportation (Fila "Consequentialist"). Overall, consequentialism ethics focuses on outcomes rather than the actions taken to achieve them. Other ethical philosophies like Deontology and Virtue Ethics both look more closely at actions as well as outcomes.

Deontology is a philosophy that focuses on breaking ethical standards down into rules that can be followed to ensure ethical practices. An example of this in the engineering workplace is the IEEE code of conduct, which every engineer is expected to follow. The general characteristics of the rules of this code are integrity, respect, and responsibility (Fila "Deontological"). In class, when discussing Deontology, we read case studies like the "IEEE Case 1999 - Flight is Also Risky." In this, a man found out that his company was committing fraud. He brought the fraud up to his supervisors, and went through all the right processes. However, his supervisors all told him they wouldn't change. The man was faced with the decision to take this to court. He chose to quit instead. Years later, the company's fraud was found out, and the man was taken to court alongside the company, as he never brought the matter to the police. This example shows how the man's actions, along with the consequences of the company's actions, are all taken into account when considering fraud (Unger). Deontology ethics

more closely mirrors Virtue Ethics rather than Consequentialism because both philosophies consider the individual engineer's actions, as well as the consequences of the actions.

Virtue Ethics as described by Aristotle boils down ethical practices into traits and qualities such as integrity, respect, and responsibility. The more traits that are deemed to be good, ethical traits, the more ethical the engineer. It also covers gaining these traits over time through action and consequence. It is a very vague and broad ethical philosophy. One text we read on Virtue Ethics was titled, "The Good Engineer: Giving Virtue its Due in Engineering Ethics." This text included a section that discusses ethics as a lived experience. This means you're not born with ethical traits, but that virtues are gained through lived experiences, and then repeated practice. Often, these virtues are learned through failure or mistakes (Harris). Virtue ethics applies to engineers and engineering in the same way as it does to people in any profession. It sets a practice of being respectful in the workplace, treating others kindly, and to hold yourself and others responsible and accountable for your actions. Virtue Ethics most closely relates to the given definition of an Ethical Engineer due to the characteristics provided.

The first characteristic of an ethical engineer is that the engineer cares enough to take action. For an engineer to be ethical in their duties, they must care deeply about their duties. An ethical engineer can not fall to apathy. They are observant so they can better help those who need it, even before they ask. They are generous, but not foolish. To be ethical in the field of engineering is to commit oneself to taking action, not to look the other way when they know something is wrong. An example of taking action in the engineering workplace would be if an engineer is finished with their work, so they have the opportunity to relax, take a break, or even pack up to head home for the day. However, they notice a coworker struggling nearby. That engineer chooses to reach out to help their coworker instead of letting them struggle alone. This

is an important trait for an ethical engineer, or for the engineering field as a whole, because this creates a community of engineers that trust and rely on each other. This community creates a better end product, a better working environment for everyone around them, and opportunities to learn and grow in different areas.

The next characteristic of an ethical engineer is a commitment to growth. An engineer's commitment to growth is not only that of knowledge, but also to grow as a person. In engineering, there is a constant inflow of new knowledge, new better practices, and new ideas. New technology in the engineering field is the product of applying your current knowledge with new ideas to grow and expand that knowledge. As a result, embarking on a life-long career as an engineer means also committing to continuous learning and growth. An example of an engineer's growth of knowledge from contemporary news is the invention of Microsoft's new Majorana 1 quantum chip. This is a first of its kind technology. Because of this, there is no reference. Therefore, current engineers must push the frontier of this new technology on their own. This requires extensive research, questioning, and growth (Bolgar). But to grow is not only about gaining new technical knowledge, but also about improving oneself as a person. This growth can take the form of new ways of thinking, and working on one's weaknesses. For example, to grow in your ways of thinking, engineers have to talk to other people. Socialization and sharing ideas can be a struggle for many people in this field, but it is important to do so in order to grow and see things from other perspectives. Overall, this commitment to growth as a characteristic of an ethical engineer is important because without this engineers can become apathetic. Apathy as a character trait is undesirable as it shows a lack of care, and will eventually become isolating.

The last characteristic of an ethical engineer is that they encourage the best out of others. This trait ties back to selflessness in a way, because a good, ethical person doesn't just look out

for themselves, they will also look out for those around them. This includes encouraging integrity, responsibility, and respect amongst peers. For example, if a coworker came to our ethical engineer with an ethical dilemma, it would be important for the engineer to give advice that encourages integrity on the part of the coworker, because that would also reflect their own integrity. This characteristic of an ethical engineer is important because it builds connection and trust between peers. Without connection and trust, the work environment would suffer.

The three given characteristics of an ethical engineer most closely align with the philosophy of Virtue Ethics. Virtue Ethics asserts the idea of lived knowledge. With each action and each consequence, a person has the opportunity for growth. This aligns well with the given characteristics of an ethical engineer, because they are required to take action, commit to growth, and encourage others to do the same. Virtue Ethics also offers comfort in failure, because it's viewed as another opportunity to grow and learn from mistakes.

In reflection, my version of an ethical engineer is what I aspire to be. I try to be kind, to be adventurous, to inspire and help others improve. I have mentioned many times in this class that I relate to the philosophy of Virtue Ethics the most out of the theories we have discussed. I believe this is reflected well in my view of an ethical engineer. I believe strongly in the idea of lived knowledge, not in perfection, not always knowing the best action in every situation, as this is an unrealistic, crippling standard. But rather, I believe by making mistakes and learning from them, I am less likely to repeat them.

I also realize that I do not know everything. I will make mistakes, many even. This means I also know that my idea of an ethical engineer is one that will constantly change as I grow. Demoralizing as it may be, I will never be my internal idea of an ethical engineer. One day, when I grow to meet my current goals and ideals, I will be a man who can see the path beyond, the

knowledge I still lack, and the decisions I am still unable to make. This, however, means that my standard for myself and others will never be a limit to my growth. I will never feel that my ideals would confine me, but rather they push me to learn and improve.

In conclusion, the most important characteristics an ethical engineer has are to care enough to take action, to commit their lives to growth, and to encourage those around them. Virtue Ethics allows for people to improve themselves over the course of their lives through their lived experiences. This philosophy of ethics differs from Consequentialism because consequentialism views all choices based on their outcomes rather than what it took to get there. Virtue Ethics differs from Deontology because Deontology follows a more strict set of rules for ethical behavior and doesn't have room for growth. Virtue Ethics, and this example of an ethical engineer, ensure not for the greatest ethical engineer, but one who will never stop improving. Perfection is an end, while growth and improving is lifelong.

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