ETHICS and RESPONSIBILITIES of ENGINEERS

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PREFACE

Training a new generation of engineers is a national necessity. Engineers have always been tasked with introducing evolving technologies for as long as society has existed. As a result, engineers have been agents of social changes for thousands of years. But, even while technology changes, engineers must continue to operate under a code of ethics that recognizes the obligation to protect and serve the public—placing the needs of emerging society before ourselves and our clients. This is very much the concept of *do no harm*. Just because an idea can be brought to fruition, does not mean that it should.

However, in an increasingly competitive business world, engineers are continually faced with ethical questions that balance the needs of clients with those of society as a whole. With the dynamic nature of technological growth, the ethical challenges become more and more difficult to quantify and the potential for unintended and unwanted consequences increases exponentially. The result is that conflicts with corporations, which operate under the fiduciary responsibility to protect the assets of their investors, emerge regularly. Individual profits and public service do not often align. That is why we have codes of ethics.

This book is designed to help new practitioners understand from where ethics originate and how they have developed in the profession. It is also designed to help engineers understand how the coursework they take aligns with the public good. What separates this book from others is the focus on the historical development of ethics for the profession and the role played by our educational system, accreditation commissions, and licensing boards. The knowledge and regulatory basis for the engineering occupation permits engineers to comprehend and address (and thereby often avoid) the challenges that might compromise the image of engineers in society. The trust that the public has in their judgment to protect and serve society is what allows engineers to be held in high esteem.

The political adage that *perception is reality* is true—and that is why gossip travels faster than the truth. Truth requires substantiation. As engineers, we function in an environment in which we are constrained to convey the truth in all that we do, and it is vital to maintain the positive public image of engineers that practitioners currently enjoy. It is a considerable challenge, but one that engineers are capable of meeting. Perhaps, along the way, engineers can better educate the public on the benefits of what they provide society, as opposed to being taken for granted.

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Dr. Bloetscher operates his own consulting firm, Public Utility Management and Planning Services, Inc. (PUMPS). PUMPS is a consulting firm dedicated to the evaluation of utility systems, needs assessments, condition assessments, strategic planning, capital improvement planning, funding options, and implementation of capital improvement construction.

Dr. Bloetscher previously served as an adjunct faculty member at the University of Miami in Coral Gables, Florida, as a former utility director and deputy director for several large municipal water and sewer systems, and served as a city manager for four years in North Carolina. He is the former Chair for the Water Resource Division Trustees, Technical and Education Council members and Education Committee for the American Water Works Association (AWWA). Dr. Bloetscher is currently the Groundwater Resource committee chair (for the fourth time), and the program and section chair for the Florida Section of AWWA. He is a Leadership in Energy and Environmental

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Dr. Bloetscher co-teaches the first semester of the capstone design course at FAU, focusing on consideration of ethical issues. This course is a prerequisite to a second class where the planning and conceptual design of green building construction is turned into preliminary plans, specifications, and basis-of-design reports. Professional ethics is included as a part of both classes. Volunteering is part of his passion as well. (In the following picture, Dr. Bloetscher is shown on the left, receiving the inaugural Volunteer of the Year award from the AWWA). Dr. Bloetscher has been nominated for the Teacher of the Year award several times by his students and has received two university-wide leadership awards, as well as two national leadership awards.

In 2012, Dr. Bloetscher received the National Council of Examiners for Engineering and Surveying Award for Connecting Professional Practice and Education for his work on the Dania Beach Nanofiltration Facility, which is the first LEED-Gold water treatment facility in the world. Dr. Bloetscher was the LEED administrator for the project. Dr. Bloetscher teaches ethics classes to professional engineers in Florida as a part of their requirement for two professional development hours of ethics every two years for licensure renewal.

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CHAPTER 1

THE PROFESSION AND ETHICAL CONDUCT

No one willingly consults an unlicensed physician. No one submits to heart surgery conducted by an unlicensed or incompetent surgeon. Your life is in the hands of the surgeon, and your risk, if something should go wrong, is death. Because the public has very little understanding of what surgeons really know or do, they intrinsically trust what their doctors say. Few will knowingly risk their lives, and thus, most will follow the advice of their physicians. To protect the public, doctors must maintain ethical standards and follow licensing laws that regulate their profession because lives are at stake. Licensure and education are designed to indicate that the surgeon is in compliance and has met the requirements necessary to perform a surgery, prescribe medications, or assign a treatment regimen. All of these procedures and safeguards are intended to improve patient health.

Engineers are no different. Given society's continued reliance on technology and infrastructure systems for economic and societal development, the demands for new technology and upgrades to existing technology suggest that engineering is one of the most significant professions in our times. Many students pursue engineering while seeking opportunities to develop new products, design new systems, and create new infrastructure. Seeing one's design turn into a product can create immense personal satisfaction.

Industry needs engineers, and, as a result, those who pursue an engineering profession are historically rewarded with good salaries and respect. The engineering curriculum typically presents significant rigor, but graduates are often rewarded with high-paying jobs. Table 1.1 shows a comparison of graduates with different degree levels. Among bachelor's degrees awarded, holders of engineering degrees receive much higher pay than the average graduate. Table 1.2 displays results from a recent study that outlines the disparity in different engineering degrees (Michigan Tech, 2020). As a result, education, experience, and ethics are part of an engineer's training that justifies higher levels of compensation.

Even within a single discipline, different opportunities exist. Table 1.3 outlines civil engineering examples.

In a world where technology and invention often outpace society's ability to immediately react, and given the reliance of society on engineers to provide innovative and necessary technology and products, it is natural to weigh and value any impression that the public attaches to the profession. One difference, among many, between surgeons and engineers is that a surgeon who makes a mistake could possibly cause the death of one person at a time, whereas an engineer who makes a mistake might cause the death of dozens or more. Examples include building failures such as the Regency Hyatt hotel in Kansas City, as well as a number of bridges and parking garages. But buildings are not all that can fail. Engineers have disastrously designed cars (Ford Pinto, GM steering columns), airplanes (Boeing 737 Max), nuclear

Table 1.1 Comparison of average earnings by education level

Education Level	Annual Average Salary	Unemployment Rate
Did not finish high school	$25,636	8.00%
High school only	$35,256	5.40%
Some college	$38,376	5.00%
Associates degree	$41,496	3.80%
BS degree	$49,124	2.80%
Engineering degree	$91,010	1.50%

Source: Bureau of Labor Statistics (early 2020).

Table 1.2 Salaries for various engineering disciplines

Industry	Source of Data	Mean Entry-Level Salary	Mean Annual Salary: All Workers	Top 10 Percent
Computer Engineering	Computer Hardware Engineers	$71,007	$117,840	$172,630
Chemical Engineering	National Labor Stats	$65,618	$114,470	$169,770
Construction Management	National Labor Stats	$55,795	$103,110	$161,510
Electrical Engineering	National Labor Stats	$64,936	$101,600	$153,240
Geological and Mining Engineering and Sciences	National Labor Stats	$61,977	$ 98,420	$151,030
Materials Science and Engineering	National Labor Stats	$65,806	$ 96,930	$148,110
Biomedical Engineering	National Labor Stats	$60,958	$ 95,090	$144,350
Civil Engineering	National Labor Stats	$56,152	$ 93,720	$142,560
Mechanical Engineering	National Labor Stats	$61,538	$ 92,800	$136,550
Environmental Engineering	National Labor Stats	$55,884	$ 92,640	$137,090
Electrical Engineering Technology/ Mechatronics	Recruiter	—	$ 86,690	$133,280
Geospatial Science and Technology	National Labor Stats	$49,571	$ 68,340	$101,400
Surveying Engineering	National Labor Stats	$48,360	$ 66,440	$102,220

Table 1.3 Example of subdiscipline salaries at 20 years of industry experience

Civil Disciplines	Pay at 20 Years
Construction	$119,000
Utilities	$118,000
Environmental	$109,000
Transportation	$106,000
Architectural	$101,000
Water resources	$100,000
Geotechnical	$100,000
Structural	$100,000

Source: American Society of Civil Engineers (ASCE) (2020).

power plants (Chernobyl), space vehicles (Challenger), and a host of computerized applications that are only as good as the engineers who designed them. Such events make headlines, which means the public's attention is attuned to them. That also means that the public citizenry is often very quick to identify any actions believed to be self-serving and therefore violates the public trust. This is the crossroad where the work we do and the public trust, our ethical obligation, can conflict. As a result, there is a need to understand why ethical engineering is critical, and to identify the stakeholders, audience, or evaluators who are making these judgments. This is especially true now, since the percentage of students who are scoring correctly on the Fundamentals of Engineering (FE) exam questions that specifically concern ethics has consistently declined over the past 15 years (see Figure 1.1).

To visualize why an understanding of ethics for engineers is critical, a little engineering history lesson is needed, which leads to the origins of ethics in Chapter 2, and its eventual application within the engineering occupation. Ethical questions have common threads with philosophy, thus creating the necessity for a brief discussion of how engineering ethics and philosophical concepts are interwoven. The conflicts are part of the challenge. Recognition of the value of ethical

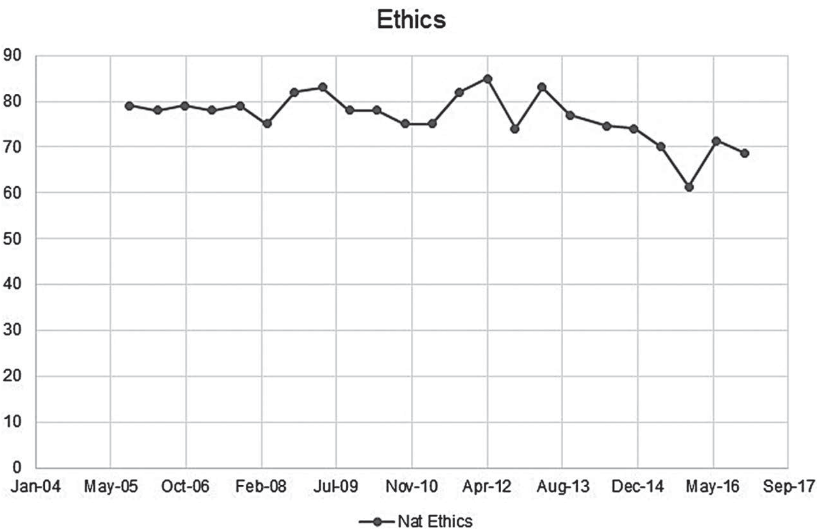

Figure 1.1 Score on the ethics questions on the FE exam from 2005 to 2017

practices has led to canons, creeds, codes, licensure, laws, education, and accreditation. Today, licensure, obtaining licensure, and the need for licensure are interwoven into the ethics discussion.

In later chapters, a discussion of education, accreditation, and vital coursework will be outlined, as will continuing education (which is required in most states). Despite the best efforts of educated and licensed engineers, ethical issues do arise—some simple, others more complex. To that end, examples of ethical challenges are presented based on cases that are generally applicable to all states.

Ultimately, the understanding of consequences and the recognition of the need for leadership are required—what we do influences and transforms society. Not all of those changes may be good. Engineers who understand the technology may be our best hope to focus things like artificial intelligence to utilitarianism for beneficial applications as opposed to predatory use. This is where the current and later chapters will take you. Enjoy the ride. If not, jump off now.

LEARNING OBJECTIVES

- Understand the role of engineers in society, and where and when ethical dilemmas may arise
- Identify characteristics of ethical practitioners
- Identify characteristics of ethical professions
- Understand how and why we differentiate between professional ethics and ethical people, and the differences between the two

1.1 WHAT ENGINEERS DO

If someone is currently pursuing an engineering career, licensure is something that may eventually be required. While certain engineering disciplines may not require licensure to the degree that civil and environmental engineers do, there are valid reasons for chemical, ocean, nuclear, industrial, transportation, aerospace, and numerous other *degreed engineers* to obtain licenses as a part of industrial or regulatory applications.

As to be discussed later in this chapter, holding a professional engineering license demonstrates to the public that the holder has obtained the requisite education, experience, and knowledge necessary to reliably make engineering decisions and judgments that protect the health, safety, and welfare of the public. Protection of the *public health*, *safety*, and *welfare* is a civic duty and a public trust issue that rivals the expectations of doctors, for similar reasons.

Most people do not really know what engineers do. In fact, many people, if asked what engineers do, would say that they drive trains (see Figure 1.2). In this chapter, what engineers do and where ethical issues may arise in the everyday efforts of these professionals will be explored. Also to be explored will be historical contexts within which we will identify how concern for ethics has evolved. It is hoped that this effort will provide a clear outline for continued ethical behavior by engineers as the needs of society evolve.

Figure 1.2 An engineer, but not the one we are talking about in this book

As with the availability of medical care, the public often takes for granted the delivery of water that is used during their morning shower, the functionality of sewer lines for the shower drain and toilet flushing, as well as the integrity of the roads and bridges being used to get to work, the stormwater system that drains the roadways, and the structure of the buildings that people work in. They assume their cars will get them to work, the traffic signals with operate correctly, their computers and cellphones will work as intended, and a host of appliances they depend on will function correctly. This is done with little regard or thought of the competence or foresight of the engineers who designed these systems.

Citizens routinely assume that cars, trucks, buses, trains, and airplanes have been properly designed, and thus, are safe to use. Admittedly, members of the public assume that the heating, air conditioning, air purification, power, and communication systems we rely upon are safe, reliable, and properly designed. They assume that someone with knowledge designed and tested these systems to ensure that they are safe and reliable.

The random person on the street probably does not know how a cellular phone works, how a television set works, why cable signals come in weak or strong, or how a car works. They just have an expectation that these things will work and will continue to work. All of these projects that the public takes for granted were designed by an engineer, and while corporate entities may absorb liability for faulty projects, the success of any project relies solely on the shoulders of the design engineers.

To qualify for these opportunities, these engineers must validate their competence by obtaining a license. As a result, having a professional engineering license allows a professional engineer to perform consulting, own his/her businesses, and bid for public funding—all while continuing to demonstrate his/her competence to the public.

1.1.1 Engineers in History

Engineering is described as the profession that relies upon scientific principles to design and build things that people need. While arguments can be made that ancient people engineered weapons, housing, and defenses, the real account of *engineering* on a large scale occurred within agriculture. Agriculture fundamentally changed how humans lived—gone were the days of the hunter-gatherer that moved from place to place as food was exhausted or migrated. Agriculture reduced competition in the woods with other tribes, allowed societies to be stationary, and improved fertility since food was more plentiful and consistent. But agriculture had its limits. In many regions, rainfall was not consistent throughout the year, so droughts and dry periods could be catastrophic as populations grew. Brian Fagan notes in *Elixir* that ancient civilizations grew and died with water, and as a result, the ability to design ditches to consistently irrigate crops became a critical profession in the ancient world. Ancient Egypt and Babylonia are examples of civilizations that grew and expanded based on the ability to engineer ditches to bring water long distances and to grow crops for the masses. If fate intervened and shifted the river so that the ditches could no longer function as designed (as happened in the ancient city of Ur), the community would scatter. These ditch designers were the first civil engineers, making civil engineering among the older professions. These ancient civil engineers first needed to bring water to agricultural use. Similarly, too much water was problematic, so the ditches needed to be able to remove excess levels as well. That required even more engineering.

As irrigation designs improved, ancient communities could grow more food than they needed, thereby creating the opportunity to trade goods, which meant a need for the construction of villages with businessmen who could connect with early traders. However, in order to get goods to market, roads needed to be created. Early roads were nothing more than trails, but as the need for trade increased, roads needed to be more well-constructed and problems like topography and water bodies needed to be overcome. Roads became a major piece of the ancient infrastructure systems that had to be designed (after water supply and disposal of unwanted water).

As population centers and commerce grew, the ability to go farther in order to trade goods and the quantity of goods to be traded suggested that cities that were built near water had an advantage. Moving goods via ship was, and still is, the cheapest way to transport things. Ancient seaports, starting with the Phoenicians and continuing through the English ports of the eighteenth century, provided the opportunity for goods to be traded across the globe. A historical review of the ancient world, from Babylonia to the Romans and through the Renaissance, depicts the development of new means to address water supplies, disposal, and roads. Many of those Roman roadbeds are still used today.

The industrial revolution changed things immensely. Getting products delivered at a faster pace became a priority. Seaports expanded throughout Europe as European ships sailed around the globe. But while ships can haul large loads cheaply, they were slow and ports were limited to coastal areas. The United States had this problem until the Erie Canal was built through western Pennsylvania and into Ohio which permitted access between the resource-rich Great Lakes and the East Coast. Soon it was determined that it was easier to make steel and other materials in the Great Lakes than to ship raw materials—that is why the great midwestern cities like Detroit, Cleveland, and Chicago developed. A connection to the Mississippi River was a benefit to many ports such as St. Louis and Memphis since no ocean travel was required to get to New Orleans.

Speed required the engineering of more than ports and cobbled roads; it required new technology for transportation in general, but also to address convenience and consistency. The industrial revolution spawned railroads, cars, planes, and computers, as well as the ancillary infrastructure to support them. It is why railroads and engineering are so intertwined. The railroads of the nineteenth century were far advanced from the use of horses and wagons—moving faster, with larger loads, and crossing difficult terrain. But the need to engineer better tracks, provide proper grades, and to carefully plan bridges, water stations, refueling, and repair facilities also accelerated.

When the nineteenth century drew to a close and the twentieth century began, there had been a series of significant structural failures, including some spectacular bridge failures (most notably the Ashtabula River Railroad Disaster in 1876, the Tay Bridge Disaster in 1879, and the Quebec Bridge collapse of 1907). In part, these failures were due to fundamental changes that were occurring at the time—larger, heavier engines were going faster and hauling longer loads versus the construction demands and limitations from decades earlier. Finally, the Boston molasses disaster provided a strong impetus for the establishment of professional licensing and a code of ethics in the United States.

Transportation was the infrastructure need in the nineteenth century. In the twentieth century, the development of large cities with accompanying public health challenges was the cause for a different infrastructure need—disinfection of water to reduce waterborne illness death. This required major water supply improvements in places like California and Florida in response to sizable population growth and development. After World War II, road expansion occurred—primarily the Interstate Highway System in the 1950s through the 1970s—to improve connectivity. Next was the need to address sewage after the Cuyahoga River fires throughout much of the twentieth century. The construction of airports to move goods and, ultimately, the use of computers and the internet to increase communication have been created by and improved upon by engineers. Improvements in one area required improvements in related and ancillary services—cars were great, but roads needed to be improved, bridges needed to be built, stormwater had to be dealt with, etc.

The historical development of civilization started with engineers and continues with engineers. Any review of history illustrates how society moved forward with the engineering of new tools (or weapons) by engineers. As a result, engineers are critical agents of social change. The difference between more- and less-developed areas is often the number of engineered improvements in the community. The involvement of engineers in the development of civilization creates a responsibility to the public health, safety, and welfare of the community.

Today, both public and private sector entities require goods and services, as well as the need to construct and acquire capital facilities on an ongoing basis. New technologies must be developed to provide services faster, more efficiently, and at less cost. With proper planning and consideration of societal needs, new projects and programs can be developed to benefit the local community.

Planning is required to anticipate needs simply because the existing processes that are being used to deliver these facilities require time and effort. Given that a large portion of the public does not really know what engineers do, yet expects that the job is done correctly while protecting everyone's interests, engineers need to communicate what they do and also make good decisions. This has become more important than ever, given that the infrastructure that built this nation is now crumbling around us—as noted in the infrastructure grades that are handed out by the ASCE every four years (see Table 1.4).

Table 1.4 ASCE infrastructure grades

Infrastructure Category	2001 Grade	2005 Grade	2009 Grade	2013 Grade	2017 Grade	2021 Grade
Aviation	D	D+	D	D	D	D+
Bridges	C	C	C	C+	C+	C
Dams	D	D	D	D	D	D
Drinking water	D	D–	D–	D	D	C–
Energy (national power grid)	D+	D	D+	D+	D+	C–
Hazardous waste	D+	D	D	D	D	D+
Inland navigable waterways	D+	D–	D–	D–	D–	D+
Levees	—	—	D–	D–	D–	D
Ports	—	—	—	C	C	B–
Public parks and recreation	—	C–	C–	C–	C–	D+
Rail	—	C–	C–	C+	C+	B
Roads	D+	D	D–	D	D	D
Schools	D–	D	D	D	D	D+
Solid waste	C+	C+	C+	B–	B–	C+
Transit	C–	D+	D	D	D	D–
Wastewater	D	D–	D–	D	D	D+
Overall	D+	D	D	D+	D+	D+

Given that engineers require public trust, students and practitioners need to be able to immediately identify anything that may raise ethical questions in the engineering field. Remember, most people do not understand what engineers do, they just expect that the engineers do it right and that the things they rely on (or paid for) will work properly. That simple trust suggests the requirement to frame a concept of ethics. But what are ethics? It seems like something to do with public expectations of competence and an application of judgments which are considered good—but that leaves us with only a foggy idea of a perception of ethics and no real answers. Let us see if the fog can be cleared.

1.2 ENGINEERING ETHICS

Ethics is an issue that surfaces in the engineering world on an ongoing basis (some states even require a formalized ethics refresher course at defined intervals of time). But what are ethics? To begin to answer this question, we must start with philosophy. A cursory review indicates that there are three potential definitions of a person with ethical behavior (Popkin and Stroll, 1993):

- One who establishes a set of values and lives by them
- One who lives by any set of values which is shared by a group of people
- One who lives by a set of values that is universally accepted

Let us look at each one of these. The first definition *is a person who establishes a set of values and lives by them*. What does one make of this definition? Is it acceptable? Do we accept a person who acts this way? In reality, few people accept this first definition of an *ethical person* because values can vary and may include individuals with a highly personalized set of ideals (e.g., Robin Hood) or individuals with frequently unacceptable behaviors (e.g., serial killers).

So obviously, *a person who lives by any set of values which is shared by a group of people* must be better. What about this definition? Is it acceptable? Do we accept a person who acts this way? These people share many of the same beliefs and conform to an accepted set of *rules* of acceptable behavior. Engineers are among groups with *common values*. That sounds good, but alas, there are many such groups including religious cults and political parties purporting ethical behavior with which we may not necessarily and fundamentally agree with. Worse still, groups with common *values* include terrorists, fascists, racists, white supremacists, neo-Nazis, and many others whom we do not support. So, this definition really does not work either.

Therefore, the third option—could *a person with a set of values that is universally accepted* be the answer? What does one make of this definition? Is it acceptable? Do we accept a person who acts this way?

Find *one* example of a universally accepted ethical value. Just one! A common one is *do not kill*, but what does that make of members of our military? Another is to *always be honest*, a worthy and perhaps the closest thing to a universal ethic. The truth can hurt and most people do not want to create bad feelings, so honesty, while being the best policy, does have its limitations. So, these specific philosophical answers are not very helpful in defining ethics for the engineering profession.

Another approach is to examine the ethical systems within individual professions. What professions do most people perceive to be ethical or unethical? (Ignore for the moment whether the perception is reality or not.) Professions that are perceived to be unethical by the public on a routine basis include:

- Salesmen of any type
- Lawyers of any type
- Politicians of any type
- Financial brokers and bankers
- Realtors
- Mechanics
- Contractors

Sometimes illegal enterprises are included, but illegality is not necessarily germane as an ethical consideration. Organized crime typically operates from a set of ethical values and core principles that are sworn to. That does not make the actions of these organizations acceptable to society by any stretch of the imagination, but there is a fundamental set of *ethics* within these organizations that fits any working definition.

In a classroom setting, prostitution is often mentioned as an *unethical activity*, but if you get what you pay for, certain economists will ask what is unethical? (Let us set aside for a moment the issues associated with forced labor, human trafficking, the view of women in general, and other clearly unethical activities that may be included in the profession.) The fact is that prostitution is illegal (except in Nevada) and perhaps immoral, but unethical? That is not as clear; and we could say the same when it comes to several criminal activities—including the illegal distribution of drugs.

Ultimately, the commonality among professions that is perceived to be unethical is the fact that a *transaction* is associated with the movement of money. Those who are perceived as being unethical must receive a transaction of money. A contract, by definition, must include consideration on both sides. So, let us compare these professionals (or occupations) to professions that are generally perceived as being ethical:

- Engineers
- Scientists
- Medical personnel
- Teachers
- Public safety workers
- Healthcare providers
- Social workers

The perception is that people who work in these professions serve the public and protect the public interest. Keep in mind that many of these professions (and a few others) involve people to be relied upon as a part of the overall efforts to contain the coronavirus pandemic. The public has expectations that those who are practicing in these professions know what they are doing even though the public may not understand what they actually do. There is a trust factor associated with these perceived-to-be ethical professions that are expected to combine competency with accountability. As a result, most practitioners within these fields must be licensed, which means they are regulated. If things go wrong with one of these service providers, they can be brought before regulatory boards and reprimanded, disciplined, or terminated.

Another common trait among those professions that are perceived to be highly ethical is that practitioners find most of their decisions are based on human judgment. Doctors, medical staff, and first responders, similar to engineers, have imperfect information, but they make a diagnosis based on their *best guess*, given the facts that are available.

However, the public expects that these practitioners will provide the correct assessment every time. This is the same with teachers who are trying to reach all of their students when those students are all obviously unique and respond to different stimuli. Many of these situations will not provide definitive answers, and furthermore, these situations are always dynamic and in flux. The concept of licensure stems from responsibility to the public and the expectation of the public that engineers will act to protect their interests.

1.3 SUMMARY

So, what should be learned from this chapter? First is that engineers have a major role in society and that virtually everything citizens use in their daily lives involves some form of engineering. The fact that engineered products are ubiquitously around us may lead to a diminishing perception of the importance of engineers to society. Engineers clearly need better marketing.

The next step is to review ethics. It is easier to identify unethical behavior than define it. It is not possible to find a set of universal ethics, but social or public expectations go a long way toward defining what is and is not ethical—we see that in the perception of unethical professions. This chapter ends with the realization that it is the public expectations of competence that differentiate ethical from unethical professions, but that there is no clear answer.

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PROBLEMS

1. Obtain the latest information available for local, regional, and national salary trends for your field of engineering. How do these trends compare to other professions?
2. Develop a table to help make these comparisons easier to understand.
3. Name and describe a universally accepted value.
4. Among the common answers to the question "what do engineers do?" is:
    a. Drive trains
    b. Get into politics
    c. Go to the Moon
    d. Act like Sheldon in the Big Bang Theory
5. Professions that are often deemed to be ethical include:
    a. Doctors
    b. Lawyers
    c. Politicians
    d. The mafia
6. Illegal activities are always unethical.
    a. True
    b. False
7. The priority for engineers is to:
    a. The public
    b. Their client
    c. The firm's shareholders
    d. The mayor

8. An ethical person is a person with a set of values and lives by them.
    a. True
    b. False
9. The expectation of the public is that engineers will:
    a. Design buildings to protect the public
    b. Report potential failures to their clients only
    c. Will tackle any problem handled to them
    d. Will find definitive answers
10. Judgment is required by engineers because:
    a. There is often imperfect information
    b. It is better than guessing
    c. It allows them to find the perfect answer to the problem
    d. There is often imperfect education