Engineering Ethics Fundamentals

Codes, Cases, & Professional Judgement

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Course Overview

Course Description

This course provides a comprehensive exploration of the ethical principles and professional responsibilities that are essential in the practice of engineering.

Engineering ethics is the application of moral principles and professional standards to the practice of engineering. Unlike purely technical disciplines, engineering directly impacts public safety, environmental sustainability, and economic systems. This course examines the ethical obligations that arise from engineering practice, the professional codes that give those obligations their formal structure, and the challenges engineers encounter with pressures of project delivery, employer relationships, and competitive markets.

Learning Objectives

Upon successful completion of this course, participants will be able to:

- Identify the foundational ethical theories used in professional engineering and explain how each can be applied to analyze a practical engineering dilemma.
- Apply the NSPE, ASCE, ASME, and IEEE codes of ethics to scenarios involving conflicts between employer or client directives and public safety obligations.
- Understand the conditions under which a licensed engineer's duty of confidentiality is overridden by the obligation to protect public safety.
- Evaluate the ethical and legal dimensions of conflicts of interest, gifts, and improper inducements in engineering practice.
- Explain the rights, obligations, and potential consequences associated with whistleblowing.
- Assess the emerging ethical responsibilities of engineers with respect to environmental stewardship, artificial intelligence, and cross-jurisdictional practice.

Intended Audience

This course is intended for licensed professional engineers across all disciplines who seek to refresh or deepen their understanding of engineering ethics. It is relevant to engineers at all career stages and the daily decisions they face.

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Chapter 1

The Architecture of Engineering Ethics

1.1 Introduction

Engineering ethics is the study of the moral decisions that arise in engineering practice, and of the norms, codes, and reasoning frameworks that engineers use, or should use, when facing them.

Engineers operate within a framework where decision can have far-reaching consequences, including loss of life, environmental degradation, or societal disruption. For most of the nineteenth century, engineering was largely an informal trade, and questions of professional conduct were handled by market forces and individual character. The industrial expansion in the late 1800s, and the accompanying wave of bridge collapses and industrial disasters, made it increasingly clear that individual character was not a sufficient safeguard (Harris et al., 2019). The formation of the American Society of Civil Engineers (ASCE) in 1852, followed by The American Society of Mechanical Engineers (ASME), The Institute of Electrical and Electronics Engineers (IEEE), and The American Institute of Chemical Engineers (AIChE) in subsequent decades, brought in the first attempts to codify what practitioners owed to the public and to each other.

The foundation of engineering ethics today lies in the recognition that engineers serve not only their employers or clients, but also the broader public. This dual obligation creates inherent tensions. That asymmetry, between the engineer's technical authority and the public's dependence on it, is where engineering ethics is applied.

1.2 The Social Contract and the Privilege of Licensure

Licensure as a professional engineer (PE), provided by the state engineering board, grants permission for the engineer to exercise independent professional judgment affecting public safety. The public trust this credential, and in exchange, engineers accept a higher standard of conduct than the general public is required to maintain. This is sometimes called the social contract of professionalism.

The National Council of Examiners for Engineering and Surveying (NCEES) administers the PE examination system and publishes the model rules that most state boards adopt (NCEES, 2023). It frames the licensed engineer's obligations in terms of protection of the public interest. Holding a PE license carries the implicit agreement that the engineer will not sacrifice public safety for private advantage, will practice only within areas of demonstrated competence, and will be honest and transparent with clients, employers, and regulators. When an engineer departs from these obligations, the state can revoke the license, because the license exists to serve a public function, not to protect a private business interest.

1.3 Ethical Frameworks as Analytical Tools

Philosophers have developed several ethical frameworks that are useful for analyzing engineering decisions. None of them, applied alone, will produce the right answer to every problem.

1.3.1 Consequentialism

Utilitarianism is the most familiar form of consequentialism where actions are evaluated by their outcomes. The morally correct action is the one that produces the greatest benefit for the greatest number. In engineering, this framework appears most visibly in cost-benefit analysis and risk assessment, where the objective is to minimize aggregate harm. Its limitation is that it can, in principle, justify serious harm to a small group if the aggregate benefit is large enough, and that justification sits uncomfortably with the notion that some people should not be sacrificed for others regardless of the numbers.

1.3.2 Deontological Ethics

This is associated most closely with Kant, developed further by subsequent philosophers, Deontological ethics maintains that certain duties are binding regardless of consequences. In practice, engineers are largely deontological in their orientation toward public safety: the obligation to hold safety paramount is not conditional on a favorable cost-benefit calculation. The duty is absolute in character, even when the specific engineering judgment involved is probabilistic.

1.3.2 Virtue Ethics

The oldest of the three major frameworks, virtue ethics asks not 'what should I do?' but 'what kind of person should I be?' In an engineering context, the virtue-based question is whether a proposed course of action reflects the integrity, honesty, and professional courage that a competent and trustworthy engineer should embody. This framework proves particularly useful in situations that codes of conduct do not address explicitly, where the question is essentially: what would a professional of good character do here? Kahneman's (2011) work on the systematic biases in human judgment is relevant in this context, as the virtuous professional must not only intend good outcomes, but actively compensate for the predictable ways in which human reasoning goes wrong under pressure and uncertainty.

Engineers who work carefully through an ethical dilemma will often find that all three of the above frameworks converge on the same answer. When they diverge, that divergence is itself informative. It signals that something genuinely difficult is at stake and that the decision deserves more than a cursory reading of an applicable code provision.

1.4 Overview of Major US Professional Codes

The principal professional codes of ethics for US engineers are those published by the NSPE, ASCE, ASME, IEEE, and AIChE. They are fundamentally similar, but they differ in emphasis and in the specific guidance they provide for their respective disciplines.

The **NSPE Code of Ethics for Engineers** is the broadest in scope, addressing licensed professional engineers across all disciplines (NSPE, 2019). Its fundamental canons place safety, health, and welfare first; require engineers to practice within their area of competence; mandate honesty and avoidance of deception; require disclosure of conflicts of interest; and prohibit conduct that would compromise professional integrity.

The **ASCE Code** (2017) and the **ASME Code of Ethics** (2012) are organized similarly, with discipline-specific elaborations.

The **IEEE Code of Ethics** (2020) places particular emphasis on avoiding harm, honesty in professional communications, and fair treatment of colleagues.

The **AIChE Code of Ethics** (2015) reflects the specific hazard profile of chemical engineering practice, with explicit attention to environmental protection and public safety in process systems.

No single code will cover every situation a practicing engineer will encounter. The codes function as starting points for ethical reasoning. Engineers should also be aware of the common pitfalls that can compromise their ethical judgement. They include cognitive biases, such as overconfidence or confirmation bias, organizational pressures, such as tight deadlines or cost constraints, and diffusion of responsibility in team environments.

Chapter 2

The Paramount Obligation: Safety, Honesty, and Professional Integrity

2.1 Public Safety as the Highest Duty

Every major US engineering code places public safety, health, and welfare above all other professional obligations. This means that when safety conflicts with the directives of an employer or client, when it conflicts with commercial pressure, or when it conflicts with an engineer's own financial interest, safety is paramount. The difficulty is in recognizing the situations in which it applies and then having the professional courage to act on it.

The collapse of the Florida International University (FIU) pedestrian bridge in Miami on the 15th of March, 2018, which killed six people and injured ten more, is an example of where the obligation to assess and communicate a safety concern was not adequately met. The bridge, which was still under construction and not yet open to the public, had been built using an accelerated construction method intended to minimize disruption to the busy road below. The day before the collapse, an engineer from the project's design firm, FIGG Bridge Engineers, left a voicemail with the Florida Department of Transportation describing a crack that had developed in a critical structural node. In the voicemail, they characterized the crack as not a structural concern. The bridge collapsed the following afternoon onto the traffic below. The National Transportation Safety Board (NTSB) investigation subsequently found that the crack was in fact indicative of a serious and developing structural failure, and that a competent analysis of the forces acting on that node would have identified the danger (NTSB, 2019).

When the engineer identified the crack that affected structural safety, their duty was not discharged when they communicated the problem while simultaneously providing an unsupported reassurance that it did not matter. Affirmative obligation requires an adequate technical assessment before a safety conclusion is reached. It also requires that the communication to responsible parties reflects the genuine state of the engineer's knowledge. In the FIU case, the engineer's analysis was incomplete at the point the reassurance was given. This gap, between what was known and what was communicated, is where the professional obligation was breached.

The paramount obligation to public safety is not a passive one, satisfied by doing nothing obviously wrong. It is an affirmative obligation to actively consider safety, to identify hazards, and to raise concerns through appropriate channels, even when doing so is inconvenient or commercially unwelcome.

2.2 When Safety Conflicts with Employer or Client Directives

The most common situation that tests an engineer's paramount obligation is a direct conflict between safety requirements and what an employer or client wants. These conflicts are common in practice and are rarely framed as direct orders to do something unsafe. More often they arrive as pressure to meet a schedule, to reduce costs, to avoid the inconvenience of a design change, or to maintain a preferred supplier relationship.

The NSPE Code is explicit: if an engineer's professional judgment is overruled in a manner that endangers life or property, the engineer is required to notify the employer or client, and, if necessary, the relevant regulatory authorities (NSPE, 2019). This is mandatory when lives are at stake.

A useful way to assess these situations is to ask: if the full facts of this decision, including the information available, the reasoning applied, and the pressures involved, were disclosed to a board of inquiry convened after a serious injury, would the decision stand up to scrutiny? This is more demanding than asking whether the decision complies with the letter of a code provision, and more appropriate for engineers who hold the public's trust.

2.3 Honesty, Transparency, and the Engineering Stamp

The engineering seal affixed to a set of drawings is a statement, to the public and to the regulatory authority, that the work has been prepared, reviewed, and approved by a licensed professional who accepts responsibility for its correctness. Stamping documents that were not personally prepared is among the most serious breaches an engineer can commit. This is because the engineer's seal extends the protective function of licensure over work where that protection is absent.

NCEES model rules require that a profession engineer exercise responsible charge (active direction and personal control) over work bearing the thier seal (NCEES, 2023). An engineer who agrees to lend a stamp to a project they have not reviewed, often under commercial or schedule pressure, is not merely violating a rule. That engineer is actively undermining the system of public protection that licensure exists to provide, while creating the appearance that it is intact.

Honesty and transparency extend well beyond the stamp. Engineers are expected to represent their qualifications accurately, to be truthful in technical reports and correspondence, and to disclose known deficiencies in their own work and in the work they oversee. The most dangerous failures in safety-critical environments are frequently those that are concealed rather than reported, because concealment removes the opportunity for correction (Reason, 1990). The honest reporting of an engineering concern, even one that reflects poorly on prior work, is how the opportunity for correction is preserved.

2.4 Conflicts of Interest

A conflict of interest arises when an engineer's personal interests, or the interests of a closely related party, create a material risk of bias in professional judgment. Financial interests are the most obvious category. For example, ownership of shares in a materials supplier, a compensation arrangement tied to project cost outcomes, or a personal relationship with a subcontractor whose work one is required to evaluate. But conflicts also arise from non-financial relationships, professional rivalries, and institutional allegiances that a reasonable observer would recognize as potentially compromising.

Professional codes do not prohibit engineers from having personal interests. However, they do require disclosure and, in most cases, either informed client consent or withdrawal from the conflicted role. The purpose of disclosure is to preserve the client's ability to rely on the engineer's independent judgment. When an engineer fails to disclose a conflict and subsequently makes a professional recommendation that benefits the undisclosed interest, the client has been deceived regardless of whether the recommendation was technically sound. The integrity of the professional relationship depends on transparency, and not just on outcome.

State engineering board disciplinary records contain a steady stream of cases in which engineers failed to disclose financial interests in work they were engaged to review. The consequences in those cases, ranging from formal reprimand to license revocation, reflect both the seriousness of the breach and the central importance of independent judgment to the professional relationship. Disclosure is the mechanism by which the client retains the ability to choose.

2.5 Gifts, Inducements, and Improper Conduct

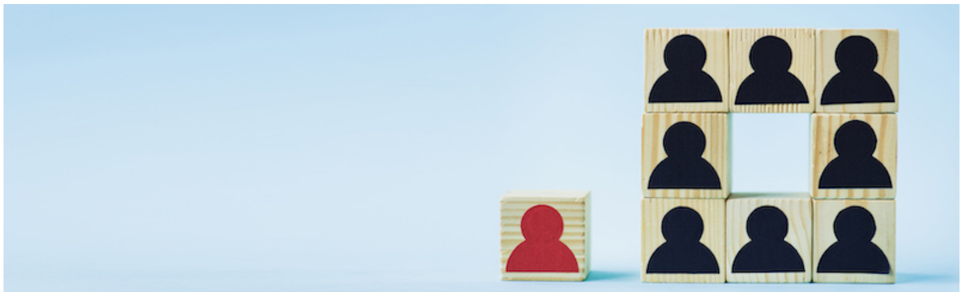
Engineering ethics codes include provisions addressing gifts and other inducements offered by contractors, suppliers, and others with a financial interest in the engineer's professional decisions. Accepting gifts from parties whose work an engineer will evaluate creates an expectation of reciprocity, whether or not that expectation is made explicit, or the engineer believes their judgment to be unaffected.

The NSPE Code of Ethics prohibits engineers from accepting gifts or gratuities that are intended to secure favors or improperly influence professional judgment (NSPE, 2019). The standard applied by most state boards is objective. It whether a reasonable person aware of the circumstances would perceive a risk of influence. That objective standard should be kept in mind when an engineer is offered something of value by a party whose interests they are professionally positioned to affect.

Borderline cases include business lunches, conference tickets, or modest promotional items. Most engineering organizations have internal gift policies that establish thresholds. Compliance with an employer's policy does not, by itself, satisfy the engineer's professional obligation, though in practice the two are often aligned. When they are not aligned, the professional obligation governs. The more demanding standard always applies.

Chapter 3

Competence, Confidentiality, and the Whistleblower's Dilemma



3.1 Practicing Within Competence

Every major engineering ethical code requires engineers to perform services only within their areas of competence. This obligation is more specific, and harder to satisfy, than it may first appear. Competence is not a fixed state based on an engineering degree. It is a continuing condition that depends on the currency of the engineer's knowledge, the adequacy of the engineer's experience for a particular type of work, and the availability of adequate oversight when the engineer is extending into unfamiliar territory.

The Therac-25 case, which ran from 1985 to 1987, is an example of the consequences when competence boundaries are not managed carefully. Therac-25 was a computer-controlled radiation therapy device. A software redesign eliminated the hardware safety interlocks present in earlier models of the same system, allowing the machine to deliver massive overdoses of radiation in at least six incidences. As a result, several patients died, and others were seriously harmed. Subsequent analysis found that the software engineers had failed to appreciate the safety-critical nature of the system they were modifying, and that the organization lacked processes adequate for validating safety-critical software in a domain where failures could not be recovered from in the field (Leveson & Turner, 1993).

Engineers are regularly required to apply their expertise in new and evolving areas, and this is often the driving force behind progress in the profession. However, the duty of competence requires a clear awareness of the one's knowledge, and the deliberate management of those limits. This may involve consulting qualified colleagues, engaging in peer review, pursuing further education, or incorporating additional expertise. Entering unfamiliar areas without these safeguards is regarded as a lapse in engineering judgement.

3.2 Supervision, Responsible Charge, and Delegation

The professional engineer in responsible charge is ethically and legally accountable for the work performed under their direction. Delegation does not transfer accountability. A senior engineer who delegates design calculations to a junior colleague remains responsible for the technical quality and safety of that work. The obligation of responsible charge, therefore, requires genuine technical engagement with supervised work.

NCEES model rules specify that responsible charge refers to the exercise of direct control and personal supervision of engineering work (NCEES, 2023). In practice, this means the supervising engineer understands the work well enough to identify errors, appreciates the assumptions on which it depends, and can assess whether the technical judgment being exercised is sound. An engineer who stamps work they have not meaningfully reviewed is exposing the public to the same risk as unstamped drawings, while creating the false impression that professional oversight has occurred. The harm in this situation is compounded by the deception.

In large organizations and complex projects, maintaining responsible charge requires deliberate and well-structured processes. The supervising engineer needs to be actively engaged in the technical work. This may sometimes require challenging project timelines or staffing decisions that limit the ability to conduct thorough review. The professional obligation of engineers remains paramount and does not yield to schedule pressure.

3.3 Confidentiality Obligations

Engineers routinely have access to proprietary information belonging to clients and employers, including unpublished designs, business strategies, process parameters, and commercially sensitive data. The obligation to protect that information is well established in professional ethics codes, is reinforced by common law duties of confidentiality and, in many cases, by express contractual terms.

An engineer who discloses a client's trade secrets to a competitor, or who uses information obtained in a professional relationship for personal financial gain, commits a serious ethical breach and is likely also committing an illegal act. Difficulty arises when confidential information relates to conditions that may endanger persons outside the client-engineer relationship, and the question becomes whether confidentiality must yield to a higher duty.

The NSPE Code of Ethics addresses this directly. It states that engineers shall treat information they obtain in a professional relationship as confidential and shall not use that information for personal advantage or disclose it without the client's consent, except as required by law (NSPE, 2019). The qualifying phrase, 'except as required by law,' points to the exception addressed in the following section. It is worth noting here that confidentiality is part of what makes the professional relationship function, and engineers who treat it carelessly, or who use confidential information for purposes beyond their engagement, undermine the trust on which professional practice depends.

3.4 When Confidentiality Yields to Public Safety

Confidentiality does not protect information about conditions that present an imminent danger to public safety. This is a clear rule embedded in most professional codes of ethics and increasingly recognized in the law. The NSPE Code of Ethics is explicit that engineers who reasonably believe their professional work involves a danger to the public, or who become aware of such danger through their professional activities, have an obligation to notify appropriate authorities, and this duty persists even when the relevant information is confidential (NSPE, 2019).

This is a fundamental ordering of priorities that reflects the social contract of licensure. The public protection rationale for requiring licensure means the license carries obligations to the public that override private contractual arrangements, at least where safety is genuinely at stake. The threshold for action is critical: the exception applies only when the risk is significant, credible, and cannot be resolved through internal channels. It does not permit disclosure simply because an engineer has a concern.

The Goodrich A7D brake scandal is an example of this conflict in engineering ethics. B.F Goodrich was contracted to supply a lightweight brake for the A7D military aircraft in 1968. When initial testing revealed that the four-rotor design was inadequate for the aircraft's stopping requirements, the company's engineers were put under significant pressure to allow the contract to proceed. They selectively interpreted the test results, and qualification reports were written that did not support the real data (Vandivier, 1972). Theses engineers withheld confidential proprietary information about a defect that was critical for the safety of the pilot and those onboard the military aircraft. A data analysis on the project reported the situation to the FBI, and a subsequent Air Force investigation confirmed the brake's defects. This case illustrates that the confidentiality of an engineer does not override their professional obligation when people are at genuine risk.

3.5 Whistleblowing: Obligations, Protections, and Consequences

Whistleblowing is the disclosure, by an engineer or other professional, of information about illegal activity, safety violations, or other misconduct to parties outside the direct line of organizational authority, including regulatory agencies, law enforcement, professional licensing boards, or the public. It is among the most difficult situations a professional engineer can face. Most engineers who expose a genuine safety concern already know they are doing the right thing, however, the potential professional and financial consequences for the individual can be severe.

The Bay Area Rapid Transit (BART) case in 1972 is one of the earliest and most documented instances of engineering whistleblowing in the United States. Three BART engineers, Holger Hjortsvang, Max Blankenzee, and Robert Bruder, identified serious concerns about the safety and reliability of the automatic train control system during its development and testing phases. Each engineer raised these concerns formally with BART's organizational structure through the appropriate internal channels. Their concerns were dismissed (Unger, 1994). The engineers then shared their concerns with members of the BART board and provided information to a local newspaper. All three were subsequently terminated by BART. Nine months later, a BART train overran a station at Fremont, California, injuring several passengers Although the concerns they raised were validated by a subsequent independent investigation, they paid a significant professional price for having raised them (Harris et al., 2019).

Following the BART case, California enacted the first statutory whistleblower protection law for professional engineers, giving legal standing to engineers who report safety concerns in good faith and suffer employment retaliation as a result. Since then, engineers working in industries regulated by federal agencies, including nuclear power, aviation, and environmental protection, have specific statutory protection against retaliation. The Energy Reorganization Act, the Safe Drinking Water Act, and the Clean Air Act, among others, prohibit employers from retaliating against employees who report safety violations to relevant federal authorities (OSHA, 2016). State-level protections vary considerably and are frequently less comprehensive than federal coverage, particularly for engineers in private-sector roles not connected to federally regulated industries.

The practical guidance for an engineer facing a potential whistleblowing situation is to:

- Document carefully and chronologically.
- Exhaust internal reporting channels before proceeding externally.
- Seek independent legal advice, at the earliest opportunity, about the specific protections and procedures that apply in the relevant industry and jurisdiction.
- Understand that the existence of a legal protection and the ease of relying on it are not the same thing.

Whistleblowing is not a step to take lightly or without preparation. But when the alternative is remaining silent in the face of a genuine public safety risk, the professional obligation is unconditional. Engineers need to understand when that threshold has been reached and what specific steps are proportionate to the risk.

Chapter 4

Environmental Ethics & Emerging Professional Obligations

4.1 Environmental Obligations in Engineering

Environmental protection has been an established component of engineering ethics for decades, gaining increasing importance as scientific understanding of long-term environmental impacts has advanced. The ASCE Code of Ethics requires engineers to 'strive to comply with the principles of sustainable development' (ASCE, 2017), while the AIChE Code identifies environment protection as a professional obligation of equivalent weight to protection of human safety (AIChE, 2015).

Engineering decisions carry environmental consequences that extend well beyond the project site and, in many cases, well beyond the project's operational life. Material choices, energy systems, waste streams, land use patterns, and emissions profiles all carry long-term environmental implications that a competent and responsible engineer is obligated to consider.

The challenge lies in the nature of environmental impacts, which are often dispersed, delayed, and uncertain in ways that immediate safety risks are not. A structurally deficient system may fail within a relatively short timeframe, whereas a poorly managed contaminated site may cause harm that persist for generations. In addition, cognitive biases lead individual engineers to undervalue risks that are distant or uncertain, compared to those that are immediate and clearly defined (Kahneman, 2011). While awareness of this bias does not eliminate it, it encourages a more deliberate and structured approach to environmental assessment, one that explicitly considers long-term and probabilistic consequences rather than relying solely on intuition judgment.

4.2 Sustainability as an Ethical Obligation

Sustainability in engineering is sometimes framed as a technical challenge with technical solutions: more efficient systems, better materials, lower-carbon energy sources. However, sustainability is also an ethical question grounded in the principle of intergenerational equity. Future generations have a legitimate stake in the built environment they will inherit, the availability of natural resources, and the long-term stability of climate systems. An engineer who transfers long-term environmental burdens to future generations to reduce present day project costs, is making an ethical decision as much as an economic one.

Frameworks such as the Leadership in Energy and Environmental Design (LEED) rating system, developed by the U.S. Green Building Council, incorporate many of these concerns into the building design process by providing structured criteria for evaluating environmental performance across multiple dimensions (USGBC, 2019). While LEED and similar frameworks are useful tools, the ethical responsibility they represent extends beyond what any certification framework can fully define. Many obligations arise at the level of individual engineering judgement and design decisions, including decisions that fall outside the formal rating criteria.

For engineers, the sustainability obligation is most directly expressed through design decisions, such as material selection, energy system configuration, life-cycle analysis, and considerations for long-term maintainability and adaptability. This obligation also extends to professional communication, particularly how engineers inform their clients about the long-term implications of design decisions, including those outcomes that may be inconvenient or unwelcome.

4.3 Emerging Ethical Challenges: AI, Automation, and the Engineer's Signature

The increasing use of artificial intelligence (AI) and automated computational tools in engineering practice raises questions that the existing ethical framework has only recently begun to address with any precision. AI tools are now applied in structural analysis, traffic modeling, environmental simulation, materials selection, site assessment, and a growing range of other engineering applications. They can process data at scales and speeds that human analysis cannot approach. They can also produce results that are difficult to audit, may contain embedded biases from training data, and can fail in ways that are not always predictable and may not resemble the failure modes of conventional software.

As previously mentioned, an engineer who applies their seal to a design retains full responsibility for its content, regardless of how that design was produced. Computational tools, including AI-based tools, do not carry legal or ethical accountability. An engineer who relies on AI-generated output without conducting adequate independent review, whether because the tool produces impressive-looking results or because thorough review takes time and project budget, is failing the obligation of responsible charge in the same manner as an engineer who stamps work they have not reviewed. While the technology may be more advanced, the ethical obligation remains the same.

The broader question, which the profession will need to address collectively through its codes and licensing frameworks, is how competency expectations should incorporate AI literacy. Engineer must be able to critically evaluate the output of an AI system, recognize the conditions under which that output might be wrong or biased, and understand the assumptions embedded within the underlying models. Without this capacity, an engineer cannot exercise the independent professional judgment required for licensure. Use of AI tools in engineering practice should, therefore, be grounded in the same rigorous standards of competence and accountability that define professional engineering judgment.

4.4 Globalization and Cross-Jurisdictional Practice

Engineering practice increasingly involves projects and professional teams that cross jurisdictional lines. An engineer licensed in one US state who participates in work located in another state has cross-jurisdictional obligations. Most states require professional licensure within the state for engineering work that affects residents of that state, with limited exceptions for incidental and short-term practice. An engineer working on a project in a jurisdiction where they are not licensed, without first confirming the relevant regulatory requirements, is potentially practicing unlawfully and has no defensible basis for claiming that the host jurisdiction's professional standards do not apply.

International practice introduces additional complexity. Professional codes and legal obligations vary considerably between countries. In some regions, the regulatory structures commonly relied upon in US practice, such as robust licensure requirements, enforced safety codes, and well-established professional oversight, may be less comprehensive or less consistently applied. An engineer engaged in international work does not set aside their professional ethical obligations when entering a different jurisdiction. The core principles of integrity, technically competence, and the commitment to public safety is an ethical obligation independent of geography. What does change is the regulatory and institutional environment in which those principles must be applied, often requiring greater judgement and initiative in the absence of the supporting frameworks typically present in US practice.

4.5 A Practical Decision-Making Framework

The ethical frameworks introduced in Chapter 1 are most useful when an engineer has the time and clarity to apply them systematically. Many real decisions are made under time pressure and with incomplete information. The following steps do not replace careful ethical reasoning, but they provide a structured first pass that can be applied in realistic conditions.

- **Step 1:** Identifying clearly who is affected by the decision and how. Engineering decisions frequently affect parties who are not present in the conversation, such as future occupants of a building, downstream water users, workers on a future construction site, residents in the vicinity of a facility. Making those parties explicitly visible in the analysis is the first step in applying the paramount obligation to public safety. This is also the step that time pressure and commercial interest will tend to suppress if left unmanaged.

- **Step 2:** Consider whether the proposed course of action is consistent with the applicable codes of ethics. If doubt remains after careful reading, the relevant professional society's ethics resources can assist. The NSPE, ASCE, and other major societies maintain advisory services for exactly this purpose. If a code provision applies, it applies regardless of commercial pressure or the organizational seniority of the instruction being received.

- **Step 3:** If the code provisions do not resolve the question, apply the three frameworks in sequence. Does the action produce the best overall outcomes when all affected parties are counted? Is it consistent with duties that hold regardless of consequences? Does it reflect the conduct of a professional of integrity? When two of the three frameworks point in the same direction, the analysis is generally reliable. When all three diverge, the situation is more complex and warrants consultation with trusted colleagues, professional advisors, or the organization's ethics resources before proceeding.

- **Step 4:** Consider the transparency test; if the full facts of this decision, the information that was available, the reasoning applied, and the context in which it was made, were disclosed to the relevant regulatory authority and to those affected by the outcome, would the decision hold up to scrutiny? If not, the discomfort that question produces is a signal worth examining carefully before acting.

Engineering ethics is an ongoing discipline that requires the same level of rigor, diligence, and intellectual honesty that good engineering practice demands of its technical problems. The professional habits built through this discipline are what differentiates a technically competent practitioner from a professional whose judgment the public can reliably trust. Ultimately, it is this distinction that underpins the privilege of licensure.

Course Summary

Engineering ethics is a practical application of moral principles and professional standards to the practice of engineering. Engineers are granted professional licensure by their State, giving them the authority to exercise independent judgment affecting public safety. In accepting that authority, the licensed engineer accepts the duty to hold public safety, health, and welfare above the interests of employers, clients, and personal financial gain. This professional obligation is affirmative, requiring the active identification of hazards, honest communication of safety concerns, and the professional courage to raise those concerns even when doing so is commercially unwelcome.

Ethical frameworks, such as consequentialism, deontology, and virtue ethics, are analytical tools that when applied together produce more reliable judgements than any single framework can on its own, especially when professional codes do not provide an explicit answer. Organizations including the NSPE, ASCE, ASME, IEEE, and AIChE, have established Codes of Ethics with a shared set of values and expectations of acceptable professional conduct: honesty, competence, independence of judgement, with the priority of public safety.

Competence is a continuing professional obligation. Practicing outside one's expertise without appropriate oversight or consultation constitutes a professional lapse, regardless of intent. This also includes the blind use of outputs produced by tools such as AI systems without adequate independent review. Computational tools do not share the engineer's legal or professional accountability as, for example, the seal of the responsible engineer in charge.

Confidentiality is a legitimate and enforceable duty, but it does not justify withholding information about known risks to public safety. And when internal processes fail to resolve credible risks to the public, it is the professional obligation of the engineer to act until those issues are resolved. Whistleblowing may be difficult as the personal consequences can be serious and the available legal protections are uneven, however, this does not change the underlying professional obligation.

Environmental stewardship and sustainability carry independent ethical weight. The consequences of engineering decisions at the design process extend beyond the immediate project and present generation.

Engineers practicing across state or national boundaries carry their professional obligations with them. The legal framework changes with jurisdiction, but the underlying standard of conduct does not.

While legal requirements establish minimum standards of conduct, engineering ethical principles often demand a higher level of responsibility.

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Appendix A

Enforcement of professional standards is essential for maintaining the credibility of the engineering profession. Licensing boards and professional organizations investigate complaints of misconduct and determine appropriate disciplinary actions. Common violations include negligence, fraud, misrepresentation and failure to protect public safety. Disciplinary actions can range from warning and fines to suspension or revocation of licensure.

The following disciplinary cases studies depict different ethical scenarios where engineers have violated their professional responsibilities, and the subsequence consequences of their action. Though these cases are from different states, they provide relevant examples of when engineers fail their professional responsibilities.

Case 1: The Seal as Misrepresentation

Facts of the case:

State of Florida licensee signed and sealed engineering documents for two residential structural engineering projects that were materially deficient.

Act/ Rule Violated:

Section 471.033(1)(g), Florida Statutes, and Rules 61G15-19.001(4), Florida Administrative Code.

Ruling:

- Board imposed a fine of $2,000 and costs of $4,479.40
- Issued a Reprimand
- Two years' probation
- Project reviews at six and 18 months
- Required to complete a course on engineering professionalism and ethics

Case 2: Practicing Engineering without a License

Facts of the case:

The respondent practiced engineering in the State of Florida without a licensee. They also signed and sealed engineering documents using another person's name and PE number.

Act/ Rule Violated:

Section 471.031(1)(a),-(c), Florida Statutes.

Ruling:

- Board imposed a fine of $5,000 and costs of $64.35

- Ordered to cease and desist from offering engineering services without a license in Florida.

Case 3: Incomplete Continuing Education for License Renewal

Facts of the case:

The respondent misrepresented the completion of their continuing education requirements in the State of Texas. They also failed to respond to the Board's request for information.

Act/ Rule Violated:

22 Tex. Admin Code §§137.17(p)(2), 137.17(p)(3), 137.51(c), and 137.63(a).

Ruling:

- One-year probated suspension contingent upon successful completion of the TTU Engineering Ethics Basic Course.
- Remittance of an Administrative Penalty of $3,250.

Case 4: Violated the Rule of Professional Conduct

Facts of the case:

The respondent violated the rule of professional conduct by taking client's money, not competing the work, and not providing information requested by the State of Washington Board.

Act/ Rule Violated:

Provisions RCW 58.09.030; RCW 58.09.040(1); RCW 58.09.060(1); RCW 18.43.105(5) & (10); RCW 18.235.130(4) and (6), WAC 332-130-030(2), (3)(a) and WAC 196-27A-020(4)(a).

Ruling:

- Default Order issued.
- License suspended for 10 years.
- Fine in the amount of $30,000.

Case 5: Practicing Engineering outside Competence

Facts of the case:

The respondent provided design parameters for two projects in the State of Washington that were later found to be significantly different from parameters recommended by a PE competent in geotechnical engineering.

Act/ Rule Violated:

Provisions RCW 18.43.105(5) & (10); RCW 18.235.130(4) & (8); and WAC 196-27A-020(2)(a)(e) & (f).

Ruling:

- Suspension of license for one year.
- Fine in the amount of $5,000.
- Respondent shall not practice geotechnical engineering services.
- For a period of a year, they will submit to the board, on a quarterly basis, a report of the work they are performing

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PDH and Licensure

Completion of this course may qualify for Professional Development Hours (PDH) credit toward engineering license renewal, subject to the rules and requirements of the relevant state licensing board. It is the responsibility of the individual engineer to confirm eligibility and report hours in accordance with their jurisdiction's continuing education requirements.

References

References cited in this course have been selected to reflect current standards and published literature. Users are encouraged to verify the currency and accuracy of all references independently, particularly where standards or regulations may have been updated since publication.