Social and Professional Issues (CE-SPR)

CE-SPR0. History and overview of social and professional issues [core]
CE-SPR1. Social context of computing [core]
CE-SPR2. Methods and tools of analysis [core]
CE-SPR3. Professional and ethical responsibilities [core]
CE-SPR4. Risks and liabilities of computer-based systems [core]
CE-SPR5. Intellectual property [core]
CE-SPR6. Privacy and civil liberties [core]
CE-SPR7. Computer crime [elective]
CE-SPR8. Economic issues in computing [elective]
CE-SPR9. Philosophical frameworks [elective]

Although technical issues are obviously central to any curriculum in computer engineering, they do not in themselves constitute a complete educational program in the field. Students must also develop an understanding of the social and professional context in which they apply their computer engineering education.

The material in this knowledge area is best covered through a combination of one required course along with short modules in other courses. On the one hand, some units listed as core—in particular, CE-SPR1, CE-SPR2, CE-SPR3, and CE-SPR5—do not readily conform to topics covered in other technical courses. Without a standalone course, it is difficult to cover these topics appropriately. On the other hand, if ethical considerations are covered only in the standalone course and not “in context” of technical topics, it will reinforce the false notion that technological processes are void of ethical issues. Thus it is important that several traditional courses include modules that analyze ethical considerations in the context of the technical subject matter.

Ethics-related modules could be developed for almost any course in the curriculum. Courses in areas such as software engineering, databases, computer networks, data mining, and human computer interfaces provide obvious context for analysis of ethical issues and should arise naturally from those subjects. For example, a programming assignment built around applications such as controlling the movement of a laser during eye surgery can help to address the professional, ethical, and social impacts of computing.

Running through all of the issues in this area is the need to speak to the computer engineer’s responsibility to proactively address societal issues by both moral and technical actions. Computer engineers must be cognizant of their responsibility to the public. They must also be aware of the potential conflicts between the obligations to their employer and the obligations to the customer, user, and others affected by their work. Chapter 2 of this report provides a more in-depth discussion of professionalism, professional practices, and the societal responsibilities of computer engineers.
CE-SPR0. History and overview of social and professional issues [core]

*Suggested time:* 1 hour

**Topics:**
- Indicate some reasons for studying social and professional issues.
- Highlight some people that influenced or contributed to the area of social and professional issues.
- Indicate some important topic areas such as social context of computing, professional and ethical responsibilities, risks and trade-offs, intellectual property, privacy, and codes of ethics and professional conduct.
- Contrast between what is legal to what is ethical.
- Explain the importance of ethical integrity in the practice of computer engineering.
- Mention some ways a computer engineer may have to make conflicting ethical choices in practicing the engineering profession.
- Explain the meaning of whistle blowing and the dilemma it sometimes places on computer engineers.
- Explain professionalism relative to a practicing engineer.
- Show that credentialing preserves the integrity of a professional.
- Describe risk and its contrast with safety.
- Explain the difference between a patent and a copyright.
- Describe how privacy issues affect the practice of computer engineering.
- Explore some additional resources associated with social and professional issues.
- Explain the purpose and role of social and professional issues in computer engineering.

**Learning objectives:**
- Identify some contributors to social and professional issues and relate their achievements to the knowledge area.
- Contrast between ethical and legal issues.
- Contrast between a patent and a copyright.
- Identify some ways of credentialing a person to practice computer engineering.
- Describe issues that contrast risk issues with safety issues.
- Identify some issues in computer engineering that address privacy.
- Describe whistle blowing and the conflicts between ethics and practice that may result from doing so.
- Describe how computer engineering uses or benefits from social and professional issues.

CE-SPR1. Social context of computing [core]

*Suggested time:* 3 hours

**Topics:**
- Introduction to the social implications of computing
- Social implications of networked communication
- Growth of, control of, and access to the Internet
Gender-related issues
International issues

Learning objectives:
- Interpret the social context of a particular implementation.
- Identify assumptions and values embedded in a particular design.
- Evaluate a particular implementation through the use of empirical data.
- Describe positive and negative ways in which computing alters the modes of interaction between people.
- Explain why computing/network access is restricted in some countries.

CE-SPR2. Methods and tools of analysis [core]
Suggested time: 2 hours

Topics:
- Making and evaluating ethical arguments
- Identifying and evaluating ethical choices
- Understanding the social context of design
- Identifying assumptions and values

Learning objectives:
- Analyze an argument to identify premises and conclusion.
- Illustrate the use of example, analogy, and counter-analogy in ethical argument.
- Detect use of basic logical fallacies in an argument.
- Identify stakeholders in an issue and our obligations to them.
- Articulate the ethical tradeoffs in a technical decision.

CE-SPR3. Professional and ethical responsibilities [core]
Suggested time: 3 hours

Topics:
- Community values and the laws by which we live
- The nature of professionalism
- Various forms of professional credentialing and the advantages and disadvantages
- The role of the professional in public policy
- The role of licensure and practice in engineering
- Contrasts of licensure in engineering but not other disciplines
- Maintaining awareness of consequences
- Ethical dissent and whistle blowing
- Codes of ethics, conduct, and practice (NSPE, IEEE, ACM, SE, AITP, and so forth)
- Dealing with harassment and discrimination
- “Acceptable use” policies for computing in the workplace
Learning objectives:
- Identify progressive stages in a whistle-blowing incident.
- Specify the strengths and weaknesses of relevant professional codes as expressions of professionalism and guides to decision-making.
- Provide arguments for and against licensure in non-engineering professions.
- Identify ethical issues that arise in software development and determine how to address them technically and ethically.
- Develop a computer use policy with enforcement measures.

CE-SPR4. Risks and liabilities of computer-based systems [core]

Suggested time: 2 hours

Topics:
- Historical examples of software risks (such as the Therac-25 case)
- Product safety and public consumption
- Implications of software complexity
- Risk assessment and management

Learning objectives:
- Explain the limitations of testing as a means to ensure correctness.
- Recognize the importance of product safety when designing computer systems.
- Describe the differences between correctness, reliability, and safety.
- Recognize unwarranted assumptions of statistical independence of errors.
- Discuss the potential for hidden problems in reuse of existing components.

CE-SPR5. Intellectual property [core]

Suggested time: 3 hours

Topics:
- Foundations of intellectual property
- Copyrights, patents, and trade secrets
- Software piracy
- Software patents
- Transnational issues concerning intellectual property

Learning objectives:
- Distinguish among patent, copyright, and trade secret protection.
- Discuss the legal background of copyright in national and international law.
- Explain how patent and copyright laws may vary internationally.
- Outline the historical development of software patents.

CE-SPR6. Privacy and civil liberties [core]

Suggested time: 2 hours
Topics:
- Ethical and legal basis for privacy protection
- Privacy implications of massive database systems
- Technological strategies for privacy protection
- Freedom of expression in cyberspace
- International and intercultural implications

Learning objectives:
- Summarize the legal bases for the right to privacy and freedom of expression in one’s own nation and how those concepts vary from country to country.
- Describe current computer-based threats to privacy.
- Explain how the Internet may change the historical balance in protecting freedom of expression.

CE-SPR7. Computer crime [elective]
Suggested time: 3 hours

Topics:
- History and examples of computer crime
- “Cracking” (“hacking”) and its effects
- Viruses, worms, and Trojan horses
- Crime prevention strategies

Learning objectives:
- Outline the technical basis of viruses and denial-of-service attacks.
- Enumerate techniques to combat “cracker” attacks.
- Discuss several different “cracker” approaches and motivations.
- Identify the professional’s role in security and the tradeoffs involved.

CE-SPR8. Economic issues in computing [elective]
Suggested time: 6 hours

Topics:
- Costing out jobs with considerations on manufacturing, hardware, software, and engineering implications.
- Cost estimates versus actual costs in relation to total costs
- Use of engineering economics in dealing with finances
- Entrepreneurship: prospects and pitfalls
- Monopolies and their economic implications
- Effect of skilled labor supply and demand on the quality of computing products
- Pricing strategies in the computing domain
- Differences in access to computing resources and the possible effects thereof

Learning objectives:
- Describe the assessment of total job costs.
- Evaluate the risks of entering one’s own business.
- Apply engineering economic principles when considering fiscal arrangements.
- Summarize the rationale for antimonopoly efforts.
- Describe several ways in which the information technology industry is affected by shortages in the labor supply.
- Suggest and defend ways to address limitations on access to computing.

**CE-SPR9. Philosophical frameworks [elective]**

*Suggested time: 2 hours*

*Topics:*
- Philosophical frameworks, particularly utilitarianism and deontological theories
- Problems of ethical relativism
- Scientific ethics in historical perspective
- Differences in scientific and philosophical approaches

*Learning objectives:*
- Summarize the basic concepts of relativism, utilitarianism, and deontological theories.
- Recognize the distinction between ethical theory and professional ethics.
- Identify the weaknesses of the “hired agent” approach, strict legalism, naïve egoism, and naïve relativism as ethical frameworks.