CMP1102 Computer Engineering Ethics

Period per Week			Contact Hour per Semester	Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	0	00	45	100	60	40	3

Rationale

Being a profession that commands a certain way of life, engineering subscribes to fundamental rules that the engineer must adhere to in practice. This course introduces the student to the practical imperatives of the engineering profession. With the ever increasing cases of computer crimes, it is important to expose the student with the implications and challenges associated with use of computers in society today.

Objectives

- To develop an understanding of the social and professional context in which computer engineering education applies.
- To emphasize the ethical considerations associated with computer engineering.
- To sensitize the computer engineering student about the potential conflicts between the obligations to their employer and the obligations to the customer, user, and others affected by their work.
- To impress on the student that computer engineers must be cognizant of their responsibility to the public.

Course Content

1. ***History and Overview***
   - 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 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 ro le of social and professional issues in computer engineering
2. ***Public Policy***
   - Introduction to the social implications of computing
   - Social implications of networked communication
   - Growth of, control of, and access to the Internet
   - Gender-related issues
3. ***International issues***
   - Methods and Tools of Analysis
   - Making and evaluating ethical arguments
   - Identifying and evaluating ethical choices
   - Understanding the social context of design
   - Identifying assumptions and values
4. ***Professional and Ethical Responsibilities***
   - 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

5. ***Risks and Liabilities***
   - Historical examples of software risks such as the Therac-25 case
   - Product safety and public consumption
   - Implications of software complexity
   - Risk assessment and management
6. ***Intellectual Property***
   - Foundations of intellectual property
   - Copyrights, patents, and trade secrets
   - Software piracy
   - Software patents
   - Transnational issues concerning intellectual property
7. ***Privacy and Civil Liberties***
   - 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
8. ***Computer Crime***
   - History and examples of computer crime
   - "Cracking" ("hacking") and its effects
   - Viruses, worms, and Trojan horses
   - Crime prevention strategies
9. ***Economic Issues in Computing***
   - 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
10. ***Philosophical Frameworks***
    - Philosophical frameworks, particularly utilitarianism and deontological theories
    - Problems of ethical relativism
    - Scientific ethics in historical perspective
    - Differences in scientific and philosophical approaches

Learning Outcomes

On completing this course the student should be able to:

- 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; and Describe how computer engineering uses or benefits from social and professional issues.

- Interpret the social context of a particular implementation; Identify assumptions and values embedded in a particular design; Evaluate a particular implementation using empirical data; Describe positive and negative ways in which computing altars the modes of interaction between people; and Explain why computing/network access is restricted in some countries
- 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; and articulate the ethical tradeoffs in a technical decision.
- 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;
- 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.
- 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; and outline the historical development of software patents.
- Summarize the legal bases for the right to privacy and freedom of expression in one's own nation; discuss how those concepts vary from country to country; describe current computer-based threats to privacy; and explain how the internet may change the historical balance in protecting freedom of expression.
- Outline the technical basis of viruses and denial-of-service attacks; enumerate techniques to combat "cracker" attacks; discuss several different "cracker" approaches and motivations; and identify the professional's role in security and the tradeoffs involved.
- 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 shortages in the labor supply affect the information technology industry; and suggest and defend ways to address limitations on access to computing.
- 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

Recommended and Reference Books

[1] Kenneth E. Himma, Herman T. Tavani, 2008. The Handbook of Information and Computer Ethics. Wiley-Interscience. ISBN-10: 0471799599 , ISBN-13: 978-0471799597

[2] J. Fernando Naveda and Stephen B. Seidman, 2006. *IEEE Computer Society Real-*

World Software Engineering Problems: A Self-Study Guide for Today's Software Professional (Practitioners). Wiley-IEEE Computer Society Pr. ISBN-10: 0471710512 , ISBN-13: 978-0471710516

[3] Winn Schwartau, D. L. Busch, 2001. *Internet & Computer Ethics for Kids: (and Parents & Teachers Who Haven't Got a Clue.)*. Interpact Press. ISBN-10: 0962870056, ISBN-13: 978-0962870057

[4] Mike W. Martin, Roland Schinzinger, 2004. *Ethics in Engineering*. McGraw-Hill Science/Engineering/Math; 4 Edition. ISBN-10: 0072831154, ISBN-13: 978-0072831153

[5] Caroline Whitbeck, Woodie C. Flowers, 1998. *Ethics in Engineering Practice and Research*. Cambridge University Press ISBN-10: 0521479444, ISBN-13: 978-0521479448

[6] Gail Dawn Baura, 2006.*Engineering Ethics: An Industrial Perspective*. Academic Press; 1 Edition.ISBN-10: 012088531X, ISBN-13: 978-0120885312