

# *Software Engineering Ethics and Professional Conduct*

SWENET OSE3 Module

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## Overview

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- Ethics and Professional Conduct
- Software Engineering Code
- Case Study Exercise

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## Ethics and Professional Conduct

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- Why should we be interested in ethics and professional conduct?
- Here is one answer:
  - Today the quality of software produced by software engineers is critical to society.
    - The success of many, if not most, human endeavors is dependent on high-quality software (e.g. applications used in financial, legal, library, health, personnel, and transportation systems)
    - Lives depend on the safety and reliability of many software systems (e.g. control of aircraft, medical devices, and nuclear power stations)
  - In addition to technical capability, the quality of software products depend on the ethics and professional conduct of the engineers that developer develop them.
- In recognition of the importance of this area, ABET (Accreditation Board for Engineering and Technology) [1] has criteria that requires study of ethics and professional conduct.

## Definitions\*

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- **ethics**
  - the discipline dealing with what is good and bad, and with moral duty and obligation
  - a set of moral principles or values
    - a theory or system of moral values.
    - the principles of conduct governing an individual or a group
- **ethical**
  - of or relating to ethics.
  - conforming to accepted professional standards of conduct
- **professionalism**
  - the conduct, aims, or qualities that characterize or mark a professional person

\**Webster's Seventh New Collegiate Dictionary*, G.&C. Merriam Co., 1966.

## SE Code of Ethics and Professional Practice

- Many professions (engineering, law, medicine) provide a code of conduct that defines and motivates professional and ethical behavior by its members.
- In 1999, an SE Code was developed by a ACM/IEEE-CS Task Force [2]
- The code addresses eight areas of concern. The following is short version of the SE Code:
  - PUBLIC - Software engineers shall act consistently with the public interest.
  - CLIENT AND EMPLOYER - Software engineers shall act in a manner that is in the best interests of their client and employer consistent with the public interest.
  - PRODUCT - Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.
  - JUDGMENT - Software engineers shall maintain integrity and independence in their professional judgment.
  - MANAGEMENT - Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.
  - PROFESSION - Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.
  - COLLEAGUES - Software engineers shall be fair to and supportive of their colleagues.
  - SELF - Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.

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## Principle 1: PUBLIC

- 1.01. Accept full responsibility for their own work.
- 1.02. Moderate the interests of the software engineer, the employer, the client and the users with the public good.
- 1.03. Approve software only if they have a well-founded belief that it is safe, meets specifications, passes appropriate tests, and does not diminish quality of life, diminish privacy or harm the environment. The ultimate effect of the work should be to the public good.
- 1.04. Disclose to appropriate persons or authorities any actual or potential danger to the user, the public, or the environment, that they reasonably believe to be associated with software or related documents.
- 1.05. Cooperate in efforts to address matters of grave public concern caused by software, its installation, maintenance, support or documentation.
- 1.06. Be fair and avoid deception in all statements, particularly public ones, concerning software or related documents, methods and tools.
- 1.07. Consider issues of physical disabilities, allocation of resources, economic disadvantage and other factors that can diminish access to the benefits of software.
- 1.08. Be encouraged to volunteer professional skills to good causes and contribute to public education concerning the discipline.

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## Principle 2: CLIENT & EMPLOYER

- 2.01. Provide service in their areas of competence, being honest and forthright about any limitations of their experience and education.
- 2.02. Not knowingly use software that is obtained or retained either illegally or unethically.
- 2.03. Use the property of a client or employer only in ways properly authorized, and with the client's or employer's knowledge and consent.
- 2.04. Ensure that any document upon which they rely has been approved, when required, by someone authorized to approve it.
- 2.05. Keep private any confidential information gained in their professional work, where such confidentiality is consistent with the public interest and consistent with the law.
- 2.06. Identify, document, collect evidence and report to the client or the employer promptly if, in their opinion, a project is likely to fail, to prove too expensive, to violate intellectual property law, or otherwise to be problematic.
- 2.07. Identify, document, and report significant issues of social concern, of which they are aware, in software or related documents, to the employer or the client.
- 2.08. Accept no outside work detrimental to the work they perform for their primary employer.
- 2.09. Promote no interest adverse to their employer or client, unless a higher ethical concern is being compromised; in that case, inform the employer or another appropriate authority of the ethical concern.

## Principle 3: PRODUCT <sub>1</sub>

- 3.01. Strive for high quality, acceptable cost and a reasonable schedule, ensuring significant tradeoffs are clear to and accepted by the employer and the client, and are available for consideration by the user and the public.
- 3.02. Ensure proper and achievable goals and objectives for any project on which they work or propose.
- 3.03. Identify, define and address ethical, economic, cultural, legal and environmental issues related to work projects.
- 3.04. Ensure that they are qualified for any project on which they work or propose to work by an appropriate combination of education and training, and experience.
- 3.05. Ensure an appropriate method is used for any project on which they work or propose to work.
- 3.06. Work to follow professional standards, when available, that are most appropriate for the task at hand, departing from these only when ethically or technically justified.
- 3.07. Strive to fully understand the specifications for software on which they work.
- 3.08. Ensure that specifications for software on which they work have been well documented, satisfy the users' requirements and have the appropriate approvals.

## Principle 3: PRODUCT<sub>2</sub>

- 3.09. Ensure realistic quantitative estimates of cost, scheduling, personnel, quality and outcomes on any project on which they work or propose to work and provide an uncertainty assessment of these estimates.
- 3.10. Ensure adequate testing, debugging, and review of software and related documents on which they work.
- 3.11. Ensure adequate documentation, including significant problems discovered and solutions adopted, for any project on which they work.
- 3.12. Work to develop software and related documents that respect the privacy of those who will be affected by that software.
- 3.13. Be careful to use only accurate data derived by ethical and lawful means, and use it only in ways properly authorized.
- 3.14. Maintain the integrity of data, being sensitive to outdated or flawed occurrences.
- 3.15 Treat all forms of software maintenance with the same professionalism as new development.

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## Principle 4: JUDGMENT

- 4.01. Temper all technical judgments by the need to support and maintain human values.
- 4.02 Only endorse documents either prepared under their supervision or within their areas of competence and with which they are in agreement.
- 4.03. Maintain professional objectivity with respect to any software or related documents they are asked to evaluate.
- 4.04. Not engage in deceptive financial practices such as bribery, double billing, or other improper financial practices.
- 4.05. Disclose to all concerned parties those conflicts of interest that cannot reasonably be avoided or escaped.
- 4.06. Refuse to participate, as members or advisors, in a private, governmental or professional body concerned with software related issues, in which they, their employers or their clients have undisclosed potential conflicts of interest.

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## Principle 5: MANAGEMENT

- 5.01 Ensure good management for any project on which they work, including effective procedures for promotion of quality and reduction of risk.
- 5.02. Ensure that software engineers are informed of standards before being held to them.
- 5.03. Ensure that software engineers know the employer's policies and procedures for protecting passwords, files and information that is confidential to the employer or confidential to others.
- 5.04. Assign work only after taking into account appropriate contributions of education and experience tempered with a desire to further that education and experience.
- 5.05. Ensure realistic quantitative estimates of cost, scheduling, personnel, quality and outcomes on any project on which they work or propose to work, and provide an uncertainty assessment of these estimates.
- 5.06. Attract potential software engineers only by full and accurate description of the conditions of employment.
- 5.07. Offer fair and just remuneration.
- 5.08. Not unjustly prevent someone from taking a position for which that person is suitably qualified.
- 5.09. Ensure that there is a fair agreement concerning ownership of any software, processes, research, writing, or other intellectual property to which a software engineer has contributed.
- 5.10. Provide for due process in hearing charges of violation of an employer's policy or of this Code.
- 5.11. Not ask a software engineer to do anything inconsistent with this Code.
- 5.12. Not punish anyone for expressing ethical concerns about a project.

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## Principle 6: PROFESSION 1

- 6.01. Help develop an organizational environment favorable to acting ethically.
- 6.02. Promote public knowledge of software engineering.
- 6.03. Extend software engineering knowledge by appropriate participation in professional organizations, meetings and publications.
- 6.04. Support, as members of a profession, other software engineers striving to follow this Code.
- 6.05. Not promote their own interest at the expense of the profession, client or employer.
- 6.06. Obey all laws governing their work, unless, in exceptional circumstances, such compliance is inconsistent with the public interest.
- 6.07. Be accurate in stating the characteristics of software on which they work, avoiding not only false claims but also claims that might reasonably be supposed to be speculative, vacuous, deceptive, misleading, or doubtful.

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## Principle 6: PROFESSION <sub>2</sub>

- 6.08. Take responsibility for detecting, correcting, and reporting errors in software and associated documents on which they work.
- 6.09. Ensure that clients, employers, and supervisors know of the software engineer's commitment to this Code of ethics, and the subsequent ramifications of such commitment.
- 6.10. Avoid associations with businesses and organizations which are in conflict with this code.
- 6.11. Recognize that violations of this Code are inconsistent with being a professional software engineer.
- 6.12. Express concerns to the people involved when significant violations of this Code are detected unless this is impossible, counter-productive, or dangerous.
- 6.13. Report significant violations of this Code to appropriate authorities when it is clear that consultation with people involved in these significant violations is impossible, counter-productive or dangerous.

## Principle 7: COLLEAGUES

- 7.01. Encourage colleagues to adhere to this Code.
- 7.02. Assist colleagues in professional development.
- 7.03. Credit fully the work of others and refrain from taking undue credit.
- 7.04. Review the work of others in an objective, candid, and properly-documented way.
- 7.05. Give a fair hearing to the opinions, concerns, or complaints of a colleague.
- 7.06. Assist colleagues in being fully aware of current standard work practices including policies and procedures for protecting passwords, files and other confidential information, and security measures in general.
- 7.07. Not unfairly intervene in the career of any colleague; however, concern for the employer, the client or public interest may compel software engineers, in good faith, to question the competence of a colleague.
- 7.08. In situations outside of their own areas of competence, call upon the opinions of other professionals who have competence in that area.

## Principle 8: SELF

- 8.01. Further their knowledge of developments in the analysis, specification, design, development, maintenance and testing of software and related documents, together with the management of the development process.
- 8.02. Improve their ability to create safe, reliable, and useful quality software at reasonable cost and within a reasonable time.
- 8.03. Improve their ability to produce accurate, informative, and well-written documentation.
- 8.04. Improve their understanding of the software and related documents on which they work and of the environment in which they will be used.
- 8.05. Improve their knowledge of relevant standards and the law governing the software and related documents on which they work.
- 8.06. Improve their knowledge of this Code, its interpretation, and its application to their work.
- 8.07. Not give unfair treatment to anyone because of any irrelevant prejudices.
- 8.08. Not influence others to undertake any action that involves a breach of this Code.
- 8.09. Recognize that personal violations of this Code are inconsistent with being a professional software engineer.

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## Ethics Exercise

- Team Exercise on Ethics Cases
  - Each team reads through their assigned ethics case.
  - Each team completes the Ethics Case Analysis for their case.
  - Each team presents their analysis to the class. Their may be disagreement, so a minority report is possible.

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# References

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1. Accreditation Board for Engineering and Technology – home page (<http://www.abet.org/>)
2. ACM/IEEE-CS Joint Task Force on Software Engineering Ethics and Professional Practices, *Software Engineering Code of Ethics and Professional Practice*, Version 5.2, (<http://www.acm.org/serving/se/code.htm>)