



# *CSE- 321*

# *Software Engineering*

Lecture : 04

**Introduction**

**Fahad Ahmed**

Lecturer, Dept. of CSE

E-mail: [fahadahmed@uap-bd.edu](mailto:fahadahmed@uap-bd.edu)

# Lecture Outlines

- ❖ Engineering ethics
- ❖ Software engineering ethics
- ❖ Green Software Engineering
- ❖ Sustainable Software Engineering
- ❖ Case Study

# ENGINEERING ETHICS

[what is it and why is it  
important]



# Engineering ethics

- Ethics (dictionary) “the philosophy of morals or the standard of character set by any nation or race”
- Morals (dictionary) “pertaining to action with reference to right and wrong”
- Engineering ethics:  
“Study of Moral Values, Issues and Decisions as they relate to Engineering Practice”

THE KILLER ROBOT, DC – 10 JUMBO JET ,  
Pegasus (spyware) by NSO group

} What about that??

# Software Engineering CODE of Ethics

Don Gotterbarn, Keith Miller,  
and Simon Rogerson

***ACM and the  
IEEE Computer Society  
join forces to create a  
code of professional practices  
within our industry.  
Now, we ask for your  
comments.***

**T**he Board of Governors of the IEEE Computer Society established a steering committee in May 1993 for evaluating, planning, and coordinating actions related to establishing software engineering as a profession. In that same year the ACM Council endorsed the establishment of a Commission on Software Engineering. By January 1994, both societies formed a joint steering committee "to establish the appropriate set(s) of standards for professional practice of software engineering upon which industrial decisions, professional certification, and educational curricula can be based." To accomplish these tasks they made the following recommendations:

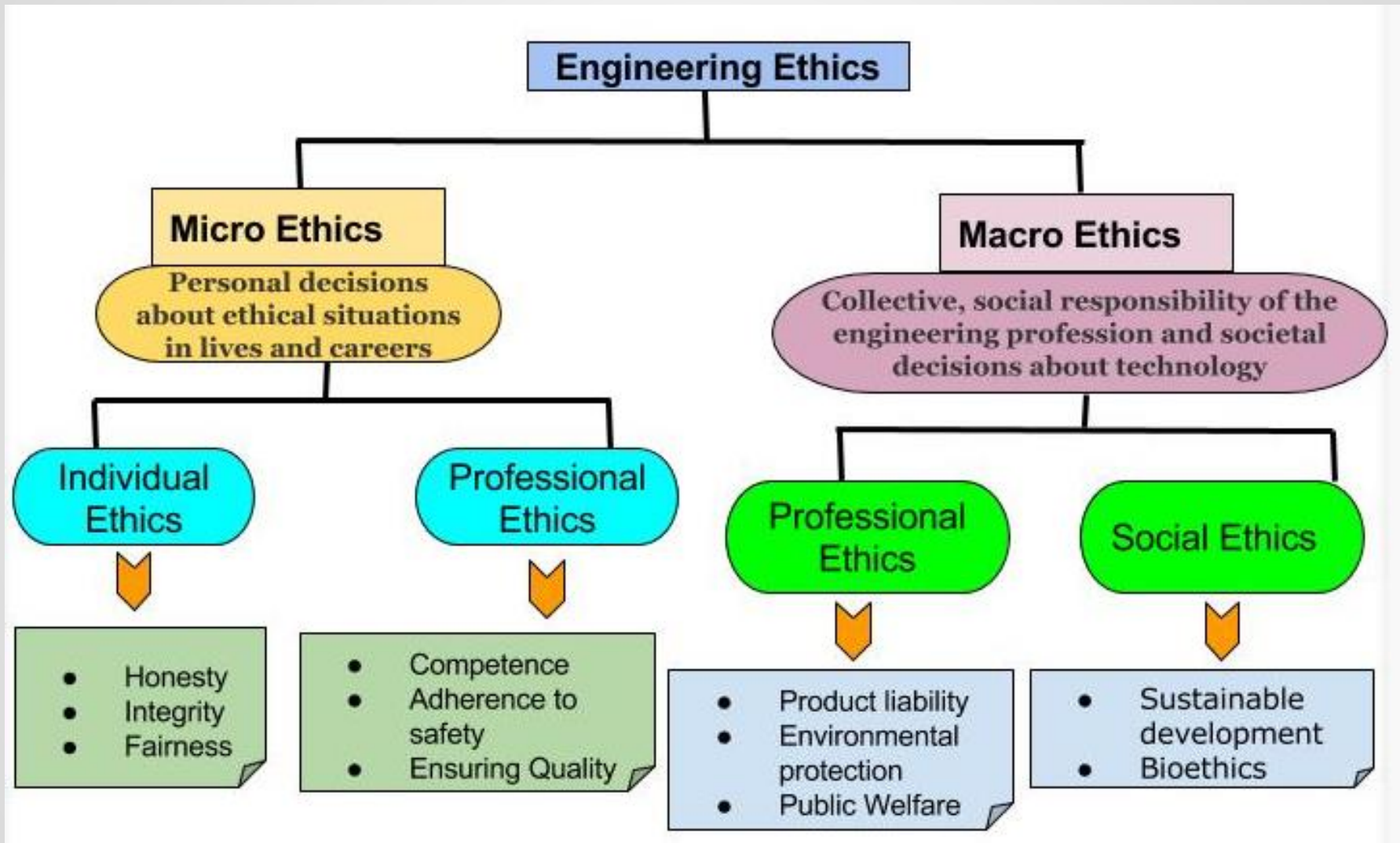
MARTIN MAYO

# Software engineering ethics

- Engineers are expected to exhibit the **highest standards of honesty and integrity**. Engineering has a direct and vital impact on the quality of life for all people.
- Software engineering ethics can be approached from **three directions**:
  - (1) it can describe the **activity** of software engineers making practical choices that affect other people in significant ways;
  - (2) it can be used to **describe a collection of principles, guidelines**, or ethical imperatives that guide or legislative action; and
  - (3) it can be used to name a discipline that studies the relationship between the other two senses of ethics. Software engineering ethics is clearly both an activity and a body of principles.
- So, ethics can be considered in three frames of reference—**individual, professional, and social**.



# Software engineering ethics



# Codes of Ethics



Codes of ethics **vary from** one professional society to another, but they typically share common features in prescribing the responsibilities of engineers to the public, their employers and clients, and their fellow engineers.

All modern codes state that the most significant responsibility of engineers is to protect the **public health, safety and welfare**.

They are not legally binding – an **engineer cannot be arrested for violating an ethical code**, but may be expelled from or censured by the engineering society.



# Codes of Ethics

The **IEEE Code of Ethics**, implemented in 1990, pledges its members

“to accept responsibility in making engineering decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment.”

This Code was developed by the ACM/IEEE-CS joint task force on Software Engineering Ethics and Professional Practices (SEEPP):

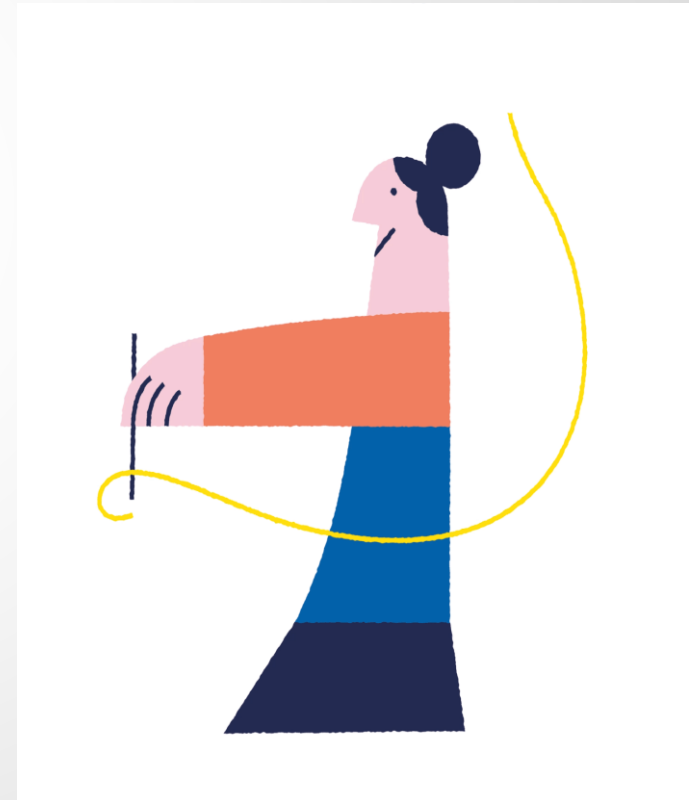
Executive Committee: Donald Gotterbarn (Chair), Keith Miller and Simon Rogerson;

# Codes of Ethics

## Software Engineering Code of Ethics and Professional Practice (Short Version)

In accordance with their commitment to the health, safety and welfare of the public, software engineers shall adhere to the following **Eight Principles**:

1. **PUBLIC** – Software engineers shall act consistently with the public interest.
2. **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.
3. **PRODUCT** – Software engineers shall **ensure that their products and related modifications** meet the **highest professional standards** possible.
4. **JUDGMENT** – Software engineers shall maintain **integrity and independence** in their professional judgment.



## Software Engineering Code of Ethics and Professional Practice (Short Version)

5. **MANAGEMENT** – Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.
6. **PROFESSION** – Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.
7. **COLLEAGUES** – Software engineers shall be fair to and supportive of their colleagues.
8. **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.

# Codes of Ethics

## Principle 1: PUBLIC

Software engineers shall act consistently with the public interest. In particular, software engineers shall, as appropriate:

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.

# Codes of Ethics

## Principle 1: PUBLIC

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.

# Codes of Ethics

## Principle 2: 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. In particular, software engineers shall, as appropriate:

- 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.



# Codes of Ethics

## Principle 2: CLIENT AND EMPLOYER

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

Software engineers shall ensure that their products and related modifications meet the highest professional standards possible. In particular, software engineers shall, as appropriate:

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.

## Principle 3: PRODUCT

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.

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.

## Principle 3: PRODUCT

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.

# Codes of Ethics

## Principle 4: JUDGMENT

Software engineers shall **maintain integrity and independence** in their professional judgment. In particular, software engineers shall, as appropriate:

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.

## 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.



# Codes of Ethics

## Principle 5: MANAGEMENT

- 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.

## Principle 6: PROFESSION

Software engineers shall advance the integrity and reputation of the profession consistent with the public interest. In particular, software engineers shall, as appropriate:

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.

## Principle 6: PROFESSION

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.

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.

## Issues of professional responsibility

- Confidentiality
  - Engineers should normally respect the confidentiality of their employers or clients irrespective of whether or not a formal confidentiality agreement has been signed.
- Competence
  - Engineers should not misrepresent their level of competence. They should not knowingly accept work which is out with their competence.

## Issues of professional responsibility

- Intellectual property rights
  - Engineers should be aware of local laws governing the use of intellectual property such as patents, copyright, etc. They should be careful to ensure that the intellectual property of employers and clients is protected.
- Computer misuse
  - Software engineers should not use their technical skills to misuse other people's computers. Computer misuse ranges from relatively trivial (game playing on an employer's machine, say) to extremely serious (dissemination of viruses).

## Principle 7: COLLEAGUES

Software engineers shall be fair to and supportive of their colleagues. In particular, software engineers shall, as appropriate:

- 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.



## Principle 7: COLLEAGUES

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

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. In particular, software engineers shall continually endeavor to:

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.

## Principle 8: SELF

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.

## How do we know what is ethical?

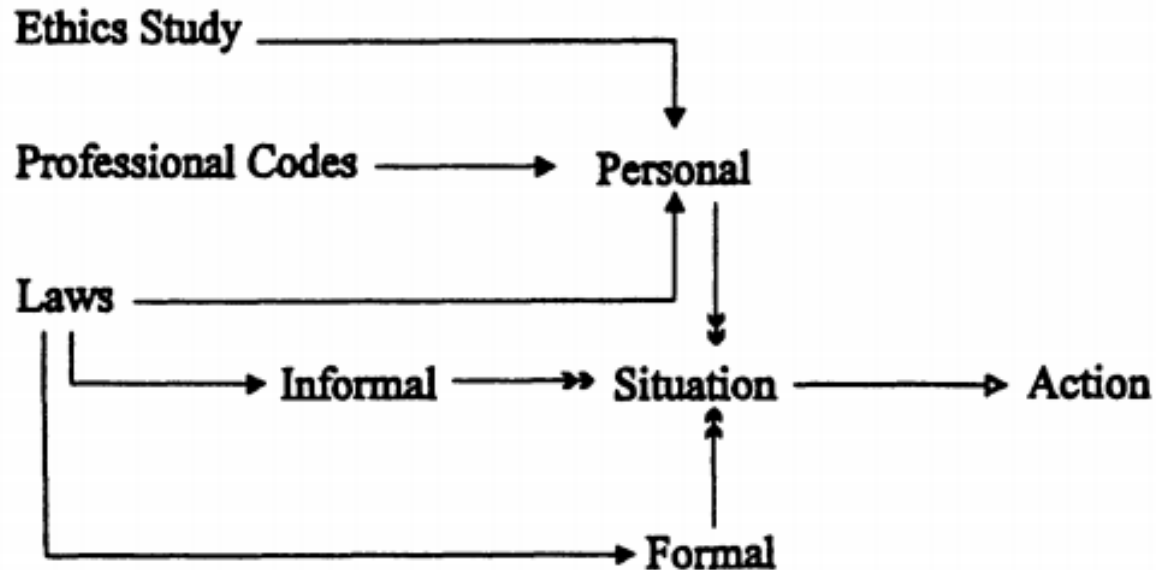


Fig. 1. Model of ethical decision making related to computer technology.

## How do we know what is ethical?

- ❖ Is it sensible?
- ❖ Is it desirable?
- ❖ Will it bring greatest good to greatest number of people?
- ❖ Will it violates others basic rights?

**Use of our own senses to judge the action.**

# Q: Intellectual property rights

**The reuse of software raises a number of copyright and intellectual property issues. If a customer pays a software contractor to develop a system.**

- Who has the right to re-use the developed code?
- Does the software contractor have the right to use that code as a basis for a generic component?
- Discuss these issues and other ethical issues associated with the reuse of software.

**Answer:**

<https://paigepecksite.wordpress.com/2016/09/29/hw15-chapter-15/>



# Sample Question

To help counter terrorism, many countries are planning the development of computer systems that track large numbers of their citizens and their actions. Clearly, this has privacy implications for citizens. On other hand, tracing system helps to protect terrorism.

Discuss the code of ethics according to software engineering of developing this type of system.

## Environmental Ethics

Deals with relationship of man with environment.

Some common topics in environmental ethics are

- ❖ Co-create rules and regulations for the ethical use of technology
- ❖ **green technology**
- ❖ Electric vehicles
- ❖ Wave energy
- ❖ **Green computing**
- ❖ Wind power
- ❖ Wind turbine
- ❖ Solar power
- ❖ Ocean thermal energy conversion



Thanks to All