

FOUNDATION DAY LECTURE

Ethical Issues for Scientists and Engineers

by

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What are Ethics?

Ethics are a science of morals, or a set of principles with a sense of purpose. Distinction between right and wrong, virtuous thoughts and actions, and being good and maximize goodness for the greatest numbers define morals and values.

Ethics are fundamental to the civilization of any society. Starting from the dawn of civilization with hunter gatherers, ethical norms and standards have evolved in different civilizations, cultures and societies at different times, with a profound influence of culture, religion, and spiritual and philosophical beliefs. Ethics are relative, not absolute ; some having converged to a core principle of a secular and commonsense- value code of conduct have become universal and fundamental to humanity . Beyond the fundamental ethics, there are others such as personal ethics based on individual's beliefs, interpersonal ethics developed between individuals or groups of individuals, societal ethics evolved between groups of individuals of different societies/cultures/religions/profession, professional ethics based on the practice of a particular profession, and regulatory ethics for regulating professional ethics.

The earliest known example of a code of ethics is the Hippocratic Oath for medical profession which was created during the 3rd century BC and continues to be administered even today world over, testifying to its relevance to the profession. Professional ethics continue to evolve with changing social ecologies but are specific to a profession as practiced in a

particular environment. An ethical professional is expected to be an ethical individual though the two may in some cases be in conflict with each other. It is pertinent here to quote Albert Einstein: “Knowledge and Skills alone cannot lead humanity to a happy and dignified life ... A student must acquire a vivid sense of the beautiful and what is morally good... Otherwise with his specialized knowledge, the student will more closely resemble a well trained dog than a harmoniously developed person”.

Why Ethics for S&T?

Paradigmatic shifts have taken place as a result of the industrial revolution leading to the evolution and definition of ethical values and codes of conduct in business, management, scientific, engineering and other professional activities in the industrialised western world. Such ethics have gradually been adopted as an integral part of teaching-learning process in schools of management all over the world. Scientists and engineers are expected to apply science and technology for progress and prosperity of society at large. They interface with society in a multidimensional way, depending on their role as a teacher, professional worker or a manager. Consequently, it is paramount for them to imbibe professional ethics. It is equally important to make sure that professional education also imparts such ethics to the students aiming at knowledge-based professional careers.

Today, Knowledge is the engine of growth and is the driving force behind rapidly changing, shifting and emerging paradigms in a globalised professional scientific and engineering environment of knowledge. Knowledge is now a multidimensional creativity/innovation in sciences (including social sciences), engineering, technologies, manufacturing, marketing, management, etc. The evolving tech-nomic-globalisation demands adherence to internationally acceptable ethical values and code of conduct. It is, therefore, essential for academic institutions to develop the mindset of science and engineering students to cultivate a sense of social responsibility

to uphold the honour and dignity of the profession in a global environment.

Ethical Issues

Ethical issues and responsibilities relate to functions of an individual in different professional environments of a student, teacher, professional, consultant, entrepreneur, manager, or industrialist.

- **Personal Ethical Issues:** At personal level, issues are fundamental in nature and relate to such desirable characteristics as high levels of integrity and honesty, wisdom, loyalty, fairness, impartiality, trustworthiness, reliability, courage, compassion, humility, divinity, love and being not submissive observer or remaining indifferent to wrong happenings.
- **Academic Ethical issues:** In an academic environment, issues relate to scientific values, scientific temper, research integrity, and scientific misconduct. Based on the report of a high level committee, President Clinton gave his “Presidential Finding” on research misconduct as “fabrication, falsification, or plagiarism in proposing, performing, or reviewing research results. Fabrication is making up data or results and recording or reporting them. Falsification is manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record. Plagiarism is the appropriation of another person’s ideas, processes, results or words without giving appropriate credit. Research misconduct does not include honest error or differences of opinion”.

Besides issues related to scientific misconduct in the form of plagiarism, duplicate or recycled publications, quality and integrity of data, there are other ethical dimensions such as :

transparency, accountability, quality of peer review, author credit, intellectual property rights, awards and rewards, conflict of interest, quality of research supervision, recruitment and assessment, sharing of R&D facilities, concern for sustainability and ecology, interaction with public and media, policy matters, regional, communal and caste factors, political interventions, corruption, antiquated governance and rules of management, whistle blower's role and fate, etc.

Professional Ethical Issues : “A Profession is a calling requiring specialized knowledge, and often long and intensive preparation, including instruction in skills and methods, as well as in the scientific, historical, or scholarly principles underlying such skills and methods, maintaining by force of organization or concerted opinion, high standards of achievement and conduct, and committing its members to continued study and to a kind of work which has for its prime purpose the rendering of public service” (Webster’s Third New International Dictionary).

A professional is expected to contribute to the progress and well-being of society in a sustainable environment through creation and dissemination of knowledge, and by using engineering knowledge and skills to develop technologies , products and services, as also regulatory mechanisms, etc consistent with an accepted ethical code of conduct.

In addition to personal and academic issues mentioned in the preceding, a professional faces a whole variety of new issues which depend on nature of profession, function, responsibility, position, and cultural/ religious environment .These include:

- Adherence to the code of conduct prescribed for the profession by a related agency,
- Regard for cultural values, traditions and practices in the work place,

- Nurturing of harmonious work culture among coworkers, monitoring and assessment, awards and rewards,
- Mentoring for excellence and leadership roles,
- Adherence to the standards of safety, concern for safe practices at workplace, protection of life from risks, hazards, injury, stress, and illness,
- Protection of environment, adoption of sustainable and green engineering practices, proper maintenance and servicing,
- Concern for conflict of interest with one-self, employer, clients, or friends, cross-cultures,
- Protection of intellectual property rights, transfer and commercialization of technologies, etc.
- Avoidance of favoritism and victimization in recruitments and promotions, grants, awards, peer reviews,
- Elimination of feudal work culture, sycophancy, regionalism, & casteism,
- De-bureaucratization of the management system with transparency and accountability,
- Elimination of corruption for money and power.

Societal Ethical Concerns

Engineering professional designs machines and develops products and processes for manufacturing using minimal energy and natural resources to minimize cost. No development is, however, possible without affecting our natural resources, ecology and bio-sphere. Dwindling energy resources, reaching limits of the carrying capacity of our ecosphere, and global warming are some of the warning signals to all global societies. Science is ethics-neutral but scientist-engineer and technology are not. Technology is a double-edged sword with useful and harmful sides.

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With extraordinary recent developments in science and technology, in particular the evolving Info-Nano-Bio, Trio has impacted ethical dilemmas literally like a “tsunami”. Nanotechnology, Biotechnology, Bio-engineering, Biomedical, Clinical trials, Bio-agro-technology, Nano-agro-technology, Field trials of GM products, Genetic testing, Biopiracy, Bio-weapons, Space technologies, Nuclear technologies, Information technologies, Communication technologies, Internet, World Wide Web, Weapons of Mass Destruction(WMD) have given birth to a new classification of ethics such as Bio-ethics, Nanotech-ethics, IT-ethics ,Space - ethics of global concern.

The extraordinary power, authority and control of the internet, with its faceless communications, invasion of liberty and personal space, monitoring of workplace, controlled terrorism, etc pose serious global ethical dilemmas. Even more serious ethical dilemmas are the rapidly emerging areas of stem cell research, genomics, proteomics, cloning (plants, animals, and, may be, humans), biopiracy, etc

Code of Conduct for a Professional Scientist / Engineer

- should keep his employer or client fully informed on all matters in respect of his assignment which are likely to lead to a conflict of interest or when, in his judgment, a project will not be viable on the basis of commercial , technical, environmental or any other risks;

- should maintain confidentiality of any information with utmost sincerity unless expressly permitted to disclose such information or unless such permission, if withheld, may adversely affect the welfare, health and safety of the community;
- should neither solicit nor accept financial or other considerations from anyone related to a project or assignment of which he is in the charge;
- should neither pay nor offer direct or indirect inducements to secure work;
- should compete on the basis of merit alone;
- should refrain from inducing a client to breach a contract entered into with another duly appointed engineer;
- should, if asked by the employer or a client, to review the work of another person or organisation, discuss the review with the other person or organisation to arrive at a balanced opinion;
- should make statements or give evidence before a tribunal or a court of law in an objective and accurate manner and express any opinion on the basis of adequate knowledge and competence;
- should reveal the existence of any interest –pecuniary or otherwise – which may affect the judgment while giving an evidence or making a statement.

Recommendations for Nurturing Ethical Values

1. Ethical values must be recognized as being central to globalised knowledge-based economies of nations. Therefore, culturing , nurturing and sensitizing of ethical values among the knowledge communities of students, teachers and professionals must be accepted as an essential

component of teaching-learning and sensitization process in all academic institutions and professional bodies

2. Knowledge of professional codes of ethics and importance of professional morality should be integrated into the professional education system so that these are cultivated as a part of professional orientation of our students
3. The privilege of the profession demands unconditional adherence to defined codes of practice and to its moral and ethical values. All academic institutions must have in-house monitoring and regulatory mechanism for ethical values through suitable ethics vigilance or knowledge integrity committees.
4. There is a dire need for a national, non-government, and quasi-judicial committee/ commission to provide a think tank and a watchdog to deal with cases of unethical professional misconduct by individuals or corporations of national importance.
5. The privilege of the profession to serve and excel demands unconditional adherence to defined codes of practice and to its moral and ethical values. This can best be protected by carefully developing codes of ethics and conduct for the professionals. A professional engineer should be required to make a written commitment to adhere to such a code. The code should be binding on its members and any deviation from the defined path should be strictly punishable or else the “privilege to serve” will become a “privilege to exploit”.
6. There is already a demand by such organizations as WTO to evolve globally acceptable and enforceable codes of professional ethics, morality and code of conduct for professionals and corporations engaged in knowledge-based global engineering services, manufacturing and trade. Such a code needs to be certified by the international standards organisation (ISO).

7. Professional responsibility to adhere to ethical values must be supported by legal and moral rights, with suitable limitations and recognition by others of such rights.
8. All institutions need to provide an empowered mechanism for respecting and protecting the whistle blower who exposes misconduct or unethical practices in an organisation. A whistle blower's act needs to be adopted nationally.

Finally, let us keep in mind that:

“History of the world civilizations shows that societies have risen to a higher level not through mechanical or technological efficiencies but by practicing sound moral and ethical values”
(Quoted from Gita & Management by Swami Bodhinanda)

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