Lecture Notes: Unit 1

(Edited and adopted from material collected from various sources)

Engineering Ethics

Unit 1: *Scope, Human Values: Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – Caring - Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality, Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law, The code of ethics for engineers - NSPE guidelines - Fundamental principles.*

Scope

Engineering is defined as 'the creative application of scientific principles to design or develop structures, machines, apparatus, processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behavior under specific operating conditions; all as respects an intended function, economics of operation or safety to life and property'. Engineering therefore is about transforming science into useful products for human comfort. Engineering is something that engineers do, and what they do has profound effects on others.

Ethics in engineering then is the ability as well as responsibility of an engineer to judge his decisions from the context of the general wellbeing of the society. It is the study of moral issues that confront engineers and engineering organizations when some crucial decisions are taken. Engineering research and practice requires that the task being performed considers all the pros and cons of a certain action and its implementation. Professional engineering bodies like, IEEE, ASME, IEI etc., have evolved comprehensive ethics codes relevant to their respective professions, based on the rich experience of their members. Independent organizations like NSPE have prepared value based ethical codes applicable to all engineering professions.

Teaching engineering ethics in academic institutions is undertaken largely through many case studies for creating awareness interactively among engineering students of all disciplines. By studying engineering ethics, the students develop awareness and assessment skill of the likely impact of their future decisions on moral and ethical grounds. Ethical standards in engineering are influenced by many factors: 1.Engineering as an experimentation for the good of mankind is a notable factor involving far reaching consequence, 2. Ethical dilemmas make engineering decisions relatively difficult to make. 3. Risk and safety of citizens as a social responsibility is a prime concern of an engineer, 4. Technological advancement can be very demanding on the engineering skill in the global context, 5. Moral values and responsible conduct will play a crucial role in decision making.

The study of engineering ethics within an engineering program helps students prepare for their professional lives. A specific advantage for engineering students who learn about ethics is that they develop clarity in their understanding and thought about ethical issues and the practice in which they arise. The study of ethics helps students to develop widely applicable skills in communication, reasoning and reflection. These skills enhance students' abilities and help them engage with other aspects of the engineering program such as group work and work placements.

There are many examples where advances in science and technology have been detrimental to safety of mankind. Famous example is the atom bomb. Based on research studies, Einstein expected that the element uranium might be turned into a new and important source of energy in the immediate future and informed Roosevelt, US President. Einstein also warned that the new development would lead to the construction of bombs. Einstein had no knowledge of the atomic bomb's manufacturing, and no influence on the decision for the bomb to be dropped in World War II. Einstein later regretted having signed the letter because it led to development and use of the atomic bomb against civilian populations.

Professional ethics

Profession is a commitment to a designated and organized occupation by virtue of being an authority over a body of knowledge with requisite skills acquired through specialized training. An occupation becomes a profession when a group of people sharing the same occupation work together in a morally acceptable way with members setting and following a certain ethics code. A professional is a practitioner belonging to a specific profession. Professional ethics, as opposed to personal values and morality, is a set of ethical standards and values a practicing engineer is required to follow. It sets the standards for professional practice, and is only learned in a professional school or while practicing ones own profession. Today, it is an essential part of professional education because it helps students deal with issues they will face.

The scope of professional ethics envelopes diverse activities like

1. Engineering as a social experimentation
2. Engineers responsibility for safety
3. Role of engineers, managers, consultants etc.
4. Rights of engineers
5. Moral reasoning and ethical theories
6. Responsibility to employers
7. Global issues and concerns

The best way to teach engineering ethics is by using case studies—not just the disaster cases that make the news, but the kinds of cases that an engineer is more likely to encounter. Many real time cases are available or some hypothetical cases can be constructed and there are methods for analyzing them. Engineering ethics can be taught in a free-standing course, but there are strong arguments for introducing ethics in technical courses as well. If the subject of professional ethics is how members of a profession should, or should not, affect others in the course of practicing their profession, then engineering ethics is an essential aspect of engineering itself and education in professional responsibilities should be part of professional education in engineering, just as it is in law and medicine.

Professional Codes of Ethics

A code of ethics prescribes how professionals are to pursue their common ideal so that each may do the best at a minimal cost to oneself and those they care about. The code is to protect each professional from certain pressures (for example, the pressure to cut corners to save money) by making it reasonably likely (and more likely then otherwise) that most other members of the profession will not take advantage. A code is a solution to a coordination problem. A professional has obligations to the employer, to customers, to other professionals- colleagues with specific expectations of reciprocity.

Individual Responsibility

An individual in his professional capacity has responsibility for the regular tasks he is assigned, for the outcomes of the actions and decisions. A professional is answerable and liable for the actions. He should have the capacity and moral strength to defend his actions/decisions. Individuals may fail for one or the other of the following reasons: 1. failure to meet minimum appropriate standards or falling very much below expectations due to negligence, 2. deliberate underperformance

Human values; morals, values and ethics

For understanding of how in order for individuals, organizations and societies to endure and function effectively, it is essential that an individual's positive exalting forces be rediscovered and revitalized. Human values embrace the entire range of values pertinent to the human condition,

interest, behavior, and aspiration. While laws are a set of rules for personal or corporate behavior and working against such rules will attract recrimination and punishment, morals on the other hand are a set of standards for personal behavior and ethics are a set of standards for professional behavior. Morals and ethics are self imposed or regulated and voluntary when broadly interpreted.

Work ethic

Work ethic is a set of values based on hard work and diligence. It is also a belief in the moral benefit of work and its ability to enhance character. A work ethic may include being reliable, having initiative, or pursuing new skills.

Workers exhibiting a good work ethic in theory should be selected for better positions, more responsibility and ultimately promotion. Workers who fail to exhibit a good work ethic may be regarded as failing to provide fair value for the wage the employer is paying them and should not be promoted or placed in positions of greater responsibility. Work ethic is not just hard work but also a set of accompanying virtues, whose crucial role in the development and sustaining of free markets.

Benjamin Franklin wrote:

'Remember, that *time is money*. He that can earn ten shillings a day by his labor, and goes abroad, or sits idle, one half of that day, though he spends but sixpence during his diversion or idleness, ought not to reckon *that* the only expense; he has really spent, or rather thrown away, five shillings besides. ... Remember, that money is the *prolific, generating nature*. Money can beget money, and its offspring can beget more, and so on. Five shillings turned is six, turned again is seven and three pence, and so on, till it becomes a hundred pounds. The more there is of it, the more it produces every turning, so that the profits rise quicker and quicker. He that kills a breeding sow, destroys all her offspring to the thousandth generation. He that murders a crown, destroys all that it might have produced, even scores of pounds.'

Criticism of work ethic

Countercultural groups, most notably slacker, hippie and hacker communities, have challenged these values in recent decades, characterizing them as submissive to authority and social convention, and not valuable in and of themselves, but only if it brings a positive result. An alternative perspective has arisen in recent years, suggesting that the work ethic is being subverted in a broader, more mainstream and more readily marketed-to proportion of society. This perspective has given rise to the phrase "work smart".

In the 19th century, the Arts and Crafts movement of William Morris in the UK and Elbert Hubbard in the US noted how "alienation" of workers from ownership of the tools of production and their work product was destructive of the work ethic because in the expanding firms of that era, the workers saw no point in doing more than the minimum. The notion of work ethic was revised to include giving up control over the work process to management so that the latter could study and "rationalize" the work process, and the notion of work ethic thereafter included acknowledgment of management control. Good work ethics includes a positive attitude with all work projects, being prepared to go the extra mile to get things done, creating a work environment where great teamwork can flourish and having the capacity to encourage the best performance standards from your fellow workers.

Service learning

Service-Learning is a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities.

Through service-learning, young people—from kindergarteners to college students—use what they learn in the classroom to solve real-life problems. They not only learn the practical applications of their studies, they become actively contributing citizens and community members through the service they perform.

Service-learning can be applied in a wide variety of settings, including schools, universities, and community-based and faith-based organizations. It can involve a group of students, a classroom or an entire school. Students build character and become active participants as they work with others in their school and community to create service projects in areas such as education, public safety, and the environment.

Example: University students in Michigan looked for ways to support struggling local non-profit organizations during difficult economic times. Graduate communication students honed their skills while providing a wide variety of public relations services with community partners, including developing press kits and managing event coordination.

Service-learning is an education and youth development strategy that connects learning objectives with meaningful service to the community. Students build civic, leadership, and academic skills while strengthening communities through service. Benefits include improved academic achievement, increased student engagement and civic skills, and stronger communities.

Service learning is a method of teaching that combines formal instruction with a related service in the community. Advocates claim that learning is enhanced through direct application in appropriate social contexts of principles and practices taught through formal instruction concurrent with guided reflection of the student's experiences. Service learning is frequently implemented as youth service. As a teaching method, service learning is best categorized as a form of experiential education. Specifically, service learning integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, encourage lifelong civic engagement, and strengthen communities for the common good. The Community Service Act of 1990, which authorized the Learn and Serve America grant program, defines service learning as:

"a method under which students or participants learn and develop through active participation in thoughtfully organized service that is conducted in and meets the needs of a community; is coordinated with an elementary school, secondary school, institution of higher education, or community service program, and with the community; and helps foster civic responsibility; and that is integrated into and enhances the academic curriculum of the students, or the educational components of the community service program in which the participants are enrolled; and provides structured time for the students or participants to reflect on the service experience." [1]

Service learning offers students immediate opportunities to apply classroom learning to support or enhance the work of local agencies that often exist to effect positive change in the community. The National Youth Leadership Council defines service learning as "a philosophy, pedagogy, and model for community development that is used as an instructional strategy to meet learning goals and/or content standards."

"Service learning is a method of instruction in which classroom learning is enriched and applied through service to others" (Florida Department of Education).

Service learning is a program that must have a perfect balance between traditional learning and real life serving experience for it to be effective. The goal of this course is to equip you with knowledge that must be used for the required service hours. Unlike other courses, service learning does not just supply you with knowledge that might never be used, it prepares you and shows to you how this knowledge can be used effectively to solve different types of social problems. The importance of service learning is immense as it combines traditional learning and physical action, adding value to each experience while transforming our views of academics and life, in terms of thinking how to apply what is learned in class to real life and enjoy that rather than just studying to pass a test. When this becomes our mindset we develop a new understanding of the learning experience and view it as not a necessary roadblock but as a building block for how it can all be applied. According to the book, 'where's the learning in service learning?'. The popularity of service learning has skyrocketed since 1994 and now has many schools teaching these courses to actively involved students. The outcome and effect of this project is not only for the transformation and good of the student, but the transformation and good of the community that is being served. Transformation in a student is necessary for the actual learning process to take place, and that only happens when you learn to connect your personal, social, and educational lives all together into one learning, changing, and serving life to benefit yourself and others.

Objections to Service Learning

Although service learning has broad support among contemporary academics, there have been some objections to this approach to education. Towson University Professor John Egger, writing in the Spring 2008 issue of the journal "Academic Questions", argued that service learning does not really teach useful skills or develop cultural knowledge. Instead, Egger maintained, service learning mainly involves the inculcation of communitarian political ideologies. Tulane Professor Carl L. Bankston III has described his own university's policy of mandating service learning as the imposition of intellectual conformity by the university administration on both students and faculty. According to Bankston, by identifying specific types of civic engagement as worthy community service, the university was prescribing social and political perspectives. He argued that this was inconsistent with the idea that individuals in a pluralistic society should choose their own civic commitments and that it was contrary to the ideal of the university as a site for the pursuit of truth through the free exchange of ideas.

Civic virtue

Civic virtue is the moral underpinning of how a citizen behaves and is involved in society. It is a standard of righteous behavior in relation to a citizens' involvement in society. A individual may exhibit civic virtue by voting, volunteering and organizing other community activities. Without an understanding of civic virtue, citizens are less likely to look beyond their families, friends and economic interests. They are less likely to help others in the community, to volunteer their time, to give to nonprofit organizations or to participate in group activity that benefits society. Related ideas for civic virtue are citizenship, philanthropy, public good, voluntarism and social capital.

Civic virtue is the cultivation of habits of personal living that are claimed to be important for the success of the community. Important aspects of civic virtue include polite conversation, civilized behavior, industry and a bona fides approach to one's participation in society. Polite, or civil conversation includes concepts of listening to what others have to say, attempting at all times to reach agreement with fellow citizens, and remaining informed on issues of import in order to offer relevant contributions to conversation. Civilized behavior, presenting one's self decently in attire, language and temperament, is intended to avoid offending others, and causing disorder. Industry is the application of one's efforts to useful endeavors which contribute to the public good, or at least do no harm. Civilised people were expected to demonstrate a bona fides, or good faith spirit regarding public life. A number of institutions and organizations promote the idea of civic virtue in the older democracies. Among such organizations are the Boy Scouts of America, and Civil Air Patrol whose US

oath, Cadet Oath and Cadet Honor Code reflect a goal to foster habits aimed at serving a larger community:

"Liberty can no more exist without virtue . . . than the body can live and move without a soul". —John Adams

Whenever we speak about the future of any society, we are really speaking about today's young and their prospects. Preparing young people for bright futures is one of the core obligations of every adult community. Of course, this means providing young people with the vocational skills they will need to prosper, but vocational skills are not enough. There also exist qualities of character that determine the success or failure of a person's life. Foremost are the virtues that make possible a life of honor and integrity.

To ensure a bright future for young people and the society they will inherit, every adult community must take seriously its responsibility to raise young people for lives of virtue. Failure to do so inevitably will result in societal decadence—literally, a "falling away," from the Latin decadere. World history has shown us time and again what happens to a society when its citizens no longer prize virtue. Citizens have an obligation to preserve the benefits of their societies for the future as well as the present—which means an obligation to foster virtuous character in the young. Preparing young people for responsible citizenship in a free society is a crucial part of this obligation for adult citizens in the United States.

At present, we are failing to meet this obligation for major sectors of our youth population, to the detriment of their life prospects and those of liberty and democracy in our society. The problems discussed in the new book, ***Failing Liberty,*** a decline in civic purpose and patriotism, a crisis of faith, a rise in cynicism, self-absorption, ignorance, and indifference to the common good—can be found among the adult population as well as among the young. But they are especially poignant when found among young people, who are in a formative time of life typically characterized by idealism, hope, and elevated ambition. As young people search for meaning in their lives, their minds are often open to all possible choices about what to believe, how to live, and what—if anything—to dedicate themselves to. When young people find nothing positive to believe in, they drift in unconstructive and sometimes destructive directions.

History has shown us time and again what happens to a society when its citizens no longer prize virtue.

In recent years, a vast amount has been written about the inferior standards of academic achievement demonstrated by too many youth. The serious gap in academic skills among many of our young people contributes to the problem. The problem is now receiving public attention. But our academic skills gap pales next to the neglect of character and civic education that we have allowed to develop. Our disregard of civic and moral virtue as an educational priority is having a tangible effect on the attitudes, understanding, and behavior of large portions of the youth population in India today.

This is not to say that all of our young are languishing. India is a large and enormously diverse country. Many young Indians shine with inspiration and purpose, and are acquiring amazing degrees of skill and talent. Others may not be there yet, but are moving in a promising direction that someday will lead them to rewarding and fulfilling commitments. But too many of today's young are floundering or worse: they have no goals that motivate them, and there are no adults in their lives who are providing them with guidance they need to find such goals. Today's cohort of youth is a highly fragmented generation. Popular accounts of a youth generation that can be labeled with a single letter or adjective—X, Y, Z, Millennial, "the dumbest generation," and so on—are little more than fanciful

caricatures. The true story of youth today is schism: on one hand, the individuals who are on track to becoming sterling citizens; on the other, the members of their cohort who have found nothing to believe in or aspire to and who have little hope of gaining the skills or purpose they will need to succeed.

Some parts of today's youth population seem wholly oblivious to the lives and concerns of all the others. It is astonishing to note that while some young Americans are risking their lives fighting in two foreign wars, the vast majority of their peers show little interest in anything related to their sacrifices. Has this level of mutual obliviousness—across an entire generation—ever occurred before in American history? Young Americans have at times dissented from national wars, as during the Vietnam War protests, but at least those protests stood as an indication that those young people (not all of them subject to the draft) did care about the state of the nation.

We cannot expect our free society to long endure if large portions of its citizenry grow up ill-educated, oblivious to the world and current affairs, out of touch with other members of their generation, and displaying little concern for their responsibilities as American citizens—in short, if they fail to acquire any commitment to civic virtue.

LIVES OF CIVIC VIRTUE *(From 'Failing Liberty')*

"My mission is to expose this very real threat to America's future, a threat far more serious than any foreign enemy could ever pose. It is a danger close at hand, one that has not received a hundredth of the resources that we devote to combating external dangers such as terrorism. Nor has the threat been recognized by our nation's leaders or policy makers, even though signs of it are everywhere. The most serious danger Americans now face—greater than terrorism—is that our country's future may not end up in the hands of a citizenry capable of sustaining the liberty that has been America's most precious legacy. If trends continue, many young Americans will grow up without an understanding of the benefits, privileges, and duties of citizens in a free society, and without acquiring the habits of character needed to live responsibly in one. As a consequence, many of today's young will be unable to recognize the encroachments on liberty that regularly arise in the normal throes of social life, and too few will be equipped to defend their society against such encroachments".

"It is not their fault. It is we—today's grown-up generation of parents, educators, opinion leaders, and public officials—who are failing to prepare them properly for their futures as citizens in a free society. Unless we begin to pay attention and meet our challenge as stewards of a priceless heritage, our nation and the prospects of all individuals dwelling here in years to come will suffer". This applies equally well to Indian circumstances.

The message can be summed up in four assertions:

- A free society requires, for its very survival, a citizenry devoted in large part to moral and civic virtue.
- When virtue loses its public footing, too few citizens accept the responsibilities necessary for sustaining liberty in that society.
- We are failing to pass along essential moral and civic virtues to large segments of the youth population.
- Unless we rectify this failure by placing a higher priority on educating young Americans for lives of moral and civic virtue, the nation will move away from liberty and toward despotism—and this movement will be both inevitable and astonishingly quick, perhaps within the space of a generation.

These are not imaginary or hyperbolic warnings. In recent times, most cultural influences on the young have become increasingly less conducive to the cultivation of civic virtue. Permissiveness, indulgence, and material inducement have replaced discipline and responsibility as the beacons of child rearing in too many contemporary homes. Major media influences on today's young commonly emphasize the glitter of celebrity and instant success. The famous figures in the limelight are too likely to have chosen vice over virtue. News stories about substance abuse, sexual scandals, and financial chicanery among the eminent outnumber stories of service, courage, or self-sacrifice by a margin too great to measure.

The lures of a celebrity culture and the barrenness of the educational landscape have left little room for broader civic concerns.

What's more, there is undeniable evidence of vanishing attention to civic and moral virtue among those who make U.S. education policy. At the federal level, education to promote citizenship has become wholly marginalized over the past decade; promoting character was eliminated as a Department of Education priority in 2009, when the current administration took office. Since federal funding tends to drive local education policies (particularly during hard economic times), this has translated into a severe diminishment of civic and character instruction from school curricula throughout the nation.

Many parents and teachers do not favor this shift in focus, but they are powerless to prevent it. The most recent study on the matter, released by the American Enterprise Institute (AEI) in September 2010, shows a striking disconnect between those who determine public educational policies and those who raise and teach the young. Funding policies now focus single-mindedly on basic math and literacy skills (with special emphasis on the remedial), squeezing out the time and resources needed to prepare students for citizenship. Yet most teachers and parents believe that citizenship, along with the essential character virtues that it requires, should occupy a central place in American education priorities, as it did in previous periods of U.S. public schooling. Unfortunately, today's federal policies have been winning the day, at least as far as our public schools are concerned, because of the power of federal financial clout. Inattention to this shift by the news media compounds the severity of the loss.

As for the young themselves, the picture is uncomfortably mixed. A significant number of today's youth shine with purpose and high aspirations. This is important to acknowledge because too many accounts sound as if this entire cohort is destined to go down the drain together. In our own research at Stanford, we have found at least one-fifth of twelve- to twenty-two-year-olds from varied backgrounds to be reassuringly well directed and very likely on track to becoming capable citizens. But important as that group is, it makes up a relatively small part of the youth population as a whole. For the remaining segments, finding purpose in life is still an elusive aim, and a devotion to moral and civic goals lies at the bottom of a long list of personal concerns, if it exists at all. For many young people today, the lures of a celebrity culture and the barrenness of their educational landscape have left little room for broader civic concerns. A distressingly large number of today's young have found nothing to strive for beyond a day-to-day pursuit of comfort and pleasure.

FOR LOVE OF COUNTRY, AND OF TRUTH

In a study of American civic virtues, gratitude must be front and center. How can a people blessed with the privileges of American citizenship not feel grateful for the unique rights and opportunities embodied in the American tradition? Or for the sacrifices, efforts, and genius of those who forged that tradition of liberty and democracy?

Yet a mood of disaffection—and, in some quarters, strident complaint—is sweeping the country. Gratitude for America's blessings is in short supply. There is no way to know how long this sour mood will last; public opinion in an open democracy can turn around quickly. But for young people raised in the present sociopolitical climate, it is especially hard to find things to believe in or civic leaders to admire. And young people need inspiration if they are to become motivated to contribute to the public good.

Isn't it the case, many will argue, that the United States has made grave errors, that the nation's actions nowadays seldom live up to the noble ideals proclaimed in its founding, and that this is what young people should be taught for the sake of critical thinking? Perhaps such statements have some truth to them, but they are far from the whole truth. Critical thinking is worthless unless built upon a base of concern and caring. To criticize something to improve it is entirely different from criticizing it to detach from it. Young people growing up in the United States need an appreciation for the American tradition to ensure that their critical perspectives on the country will be constructive rather than nihilistic. Any balanced view of American history will conclude that this sense of appreciation is well warranted.

Certainly many shortcomings in the American past have merited complaint, especially for people and groups who have suffered discrimination and exclusion. But there is a long story of successive liberation and eventual progress in American social life, even if at times too slowly realized. Nor is our story of successive liberation and progress accidental—quite the opposite. The nation was founded with the explicit intention of creating a government that would allow for such progress through reflection and conscious choice. The founders realized that this would be an uncertain path, at times difficult to forge and always beset by formidable obstacles. Indeed, the founders predicted that the United States would be a unique and decisive experiment in the ability of humans to enjoy political liberty. The Federalist Papers began with this stirring observation:

It seems to have been reserved to the people of this country, by their conduct and example, to decide the important question, whether societies of men are really capable or not of establishing good government from reflection and choice, or whether they are forever destined to depend for their political constitutions on accident and force . . . and a wrong election of the part we shall act may, in this view, deserve to be considered as the general misfortune of mankind.

Conceived in this way, as an experiment in good government, individual choice, liberty, and human dignity, the United States occupies a special place in the pantheon of human moral endeavor. However imperfectly, the American tradition has remained true to the intention of the founders, providing a long string of affirmative answers to their original experimental question.

The essential civic manifestation of gratitude and affection for one's country is patriotism—the commitment to society that grows out of a spirit of love and appreciation for the benefits that society has bestowed. The founders recognized that love of country and patriotism were inextricably linked to the virtues required to sustain a free society. Thomas Jefferson, for example, copied the following quote from Montesquieu in his Commonplace Book:

In a republic . . . virtue may be defined as the love of the laws and of our country. As such love requires a constant preference of public to private interest, it is the source of all private virtue. . . . Now a government is like everything else: to preserve it we must love it. Everything, therefore, depends on establishing this love in a republic; and to inspire it ought to be the principal business of education, but the surest way of instilling it into children is for parents to set them an example.

In our time (as in other contentious times and places), patriotism has become a contested word. One side of today's political spectrum looks upon it with suspicion and distrust, echoing Samuel Johnson's witticism that "patriotism is the last refuge of the scoundrel." Too many on the other side claim patriotism as their side's sole property, using it as a political wedge issue and limiting it to token gestures such as waving flags and wearing lapel pins. This is unhealthy for civic cohesion. Debates can and should rage about the most sensible and admirable versions of patriotism, but its value as a necessary civic virtue should not be doubted. Without a patriotic attachment to one's society, the kinds of full devotion that spur citizens to make crucial sacrifices for the public good could never exist. There are times when every society needs this full devotion for its very survival.

Patriotism, of course, is a particular attachment to one's own society. Some influential educators have objected to fostering patriotism in students because they fear that particular attachments lead inevitably to conflict with those who harbor competing attachments. In the place of patriotism, they would promote "world citizenship" or "cosmopolitanism." In a time of rapid globalization, this argument has found considerable favor among both intellectuals and the business community—the former wishing to avoid global conflict, the latter wishing to facilitate international commerce.

It is true that particularistic devotions can be exclusionary, discriminatory, and predatory, all of which can create serious moral problems. Moreover, provincialism can be bad for commerce. But patriotism does not need to take a chauvinistic or insular form. It can go hand in hand with a concern for the welfare of people everywhere, with a respect for universal human rights and a belief in universal justice. Indeed, that is exactly in the spirit of the American Constitution. The founders were convinced that the success of their "experiment" would promote human dignity and freedom everywhere—and that its failure would be a misfortune to all mankind.

Unfortunately, global citizenship is an empty concept. It contains none of the essential meanings that students need to learn for their own futures as citizens in an actual society: the privileges and rights granted to citizens of a particular country, or the duties and obligations to which they are expected to commit themselves. Our students will not be able to vote for a public official of the world; they will not petition to a world court to address a grievance; no global government will protect their property or their rights; they will not pay taxes to the world; they will not be inducted to serve in a world jury or a world army.

Citizenship is particularistic. A student can learn how to be a good citizen only by learning the particular rights and obligations that the country's citizenship entails. Students can understand the meaning of these rights and obligations only by learning about the country's constitutional tradition as it has evolved since the nation's founding. Patriotism is a particular attachment to this tradition. Based on gratitude and an informed appreciation of the tradition, patriotism gives emotional support to citizenship and serves as the primary source of civic purpose.

Without question, our students need to absorb as much as possible about the world beyond our borders. They should learn about the world's diverse cultures and master foreign languages. They very likely will participate in the global economy. As a moral matter, American students should develop an understanding of the perspectives of people around the world so that they can respond to others' needs and problems in a humane way. But the present-day emphasis on world citizenship and cosmopolitanism in our schools obscures rather than clarifies what it really means to be a responsible citizen. And it works against the very concerns that animate those who promulgate it, such as the fear that patriotism fosters quarrels and injustice.

Patriotism, far from being "the last refuge of the scoundrel," is indispensable.

Patriotism is not the only essential concept to draw controversy among educators in recent years. There have been parallels in the handling of indispensable notions such as morality and truth. In the latter part of the twentieth century, moral relativism (the belief that there are no universal moral values) became so fashionable that many educators avoided using the term "moral" in their classrooms, believing that it should be left to fundamentalist groups such as the Moral Majority. At the same time, a smaller (and less influential) contingent was denying the existence of truth on the grounds that perceived reality is inevitably shaped by distorted perspectives, especially perspectives that reflect the self-interests of a "ruling class" with the power to determine what is presented in cultural settings such as public schools.

Again, as in the case of patriotism, such conclusions are misguided. Arguments about what is morally right and what is true are educative for students; but arguments that there is no such thing as morality, or that truth is an illusion, make little sense, and they can discourage a student's motivation to learn how best to pursue the good and the true. It is time for patriotism, the motivational basis for informed and devoted citizenship, to join morality and truth as the highly valued objectives of education in American schools.

WHAT LIBERTY MEANS

Liberty in a society makes possible a range of important personal freedoms, including religious, economic, ideological, family, and lifestyle freedoms. But liberty and freedom are not strictly synonymous, because there are some unrestrained freedoms (for example, from individual responsibility, from obligations and duties, and licentiousness) that erode liberty by damaging the social framework needed to protect it. It is important to cultivate virtue in young people for the very reason that virtue alone can provide the self-imposed restraints that can enable them to live responsibly under conditions of political liberty.

For centuries, political philosophers have written about the nature of liberty. As in any scholarly field, debates and distinct ideological positions have been staked out. I am a consumer rather than a maker of political philosophy, and I use a somewhat eclectic mix of these positions. Some thinkers refer to "negative" liberty and "positive" liberty: the former denoting the absence of social interference with private actions, the latter the capacity to influence the governance of one's society. There have been fascinating debates about whether these two kinds of liberty are compatible, which is primary, and so on.

As interesting as these debates are, they are not my focus. I assume that for full citizenship, young people must be prepared for both kinds of political liberty: they must learn to live in a free society and to participate in its governance. The question is how to prepare them so that they and the generations after them will continue to enjoy access to all the freedoms that political liberty makes possible.

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Excerpted from Failing Liberty 101: How We Are Leaving Young Americans Unprepared for Citizenship in a Free Society, by William Damon (Hoover Institution Press, 2011). © 2011 by the Board of Trustees of the Leland Stanford Junior University. All rights reserved.

Valuing Time:

A first step in good time management is to understand the value of your time. If you are employed by someone else, you need to understand how much your employer is paying for your time, and how much profit he or she expects to make from you. If you are working for yourself, you should have an idea of how much income you want to bring in after tax. By working these figures back to an hourly rate, this gives you an idea of the value of your time. By knowing the value of your time, you should be able to tell what tasks are worthwhile to perform, and which tasks give a poor return. This helps you cut away the low value jobs, or argue for help with them.

Scarcity determines value—this is a basic tenet of economics.

"I've lived most of my everyday life without sight of values. I say this because I live most days without sight of values. Now the question is, *"What do I truly value?"* At the end of the day, I think I most value relationship with God, family and friends. But I'm not really sure, because these stated values don't reflect my honest use of time."

We tend to value money, fame, relationships, success, experiences and more. However, *time is the single scarcest element in our life*. Time isn't something that is recoverable. Once it has past, time becomes history. We don't receive more time once we run out. We can expect paychecks, successes, and new experiences but don't know when we'll breathe our last. Every passing second brings us closer to our last day. Nothing else in life does anything like this.

Our use of time shows who we are, what we're made of, and what we value most. If you track how you use your time, you'll discover your true values. If you're anything like me, you may discover a surprising disparity between your stated values and your true values.

Let's commit our time to living out our stated values. Change begins with every new day and week.

A first step in good time management is to understand the value of your time.

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Using a Tool:

Calculating the Value of Your Time:

If you are an employee and you don't have a charge-out rate, estimate the annual value of your time using the table below (we show you later how to estimate these figures if you can't get hold of them).

	Your salary
Add	Your benefits
Add	Employer's payroll tax
Add	A contribution for rent, equipment, heat, light, etc.
Add	A contribution for overheads and supporting services
Add	Profit expected

Total:

These figures can be difficult to get hold of. As all we need is an approximate figure, the following may help:

- Your salary and benefits: you should know! The value of benefits will often be shown on, for example, end-of-year tax statements.
- Employer's Payroll Tax: is dependent on the country you live in. Your Human Resources or Accounting Department may be able to tell you this.
- Contribution for rent, equipment, heat, light, etc: it is difficult to get to this figure unless you can read the accounts of your organization. With this in mind, you can use a value of 10% of your salary and benefits as a 'rule of thumb'.
- Overheads: again, this information is difficult to get unless you can read your organization's accounts. Use a value of 40% of your salary and benefits as the rule-of-thumb for this.
- Profit Expected: in reality, this will depend on the sector you are in. Again, in the absence of reliable figures, use a value of 50% of all other costs as the profit you should bring in. This is a good value for a company that sells people's time. Other businesses may expect greater profit from your activity.

Example:

As an example, you may earn a salary of **Rs5,50,000** per year, with an additional **Rs1,00,000** of benefits. The country you work in has a Income tax or Payroll Tax of 12%.

The annual value of her time can be estimated at:

	you salary	5,50,000
Add	your benefits	1,00,000
Add	Employer's payroll tax	6,50,000 x 12% = 78,000
Add	A contribution for rent, etc.	6,50,000 x 10% = 65,000
Add	A contribution for overheads	6,50,000 x 40% = 2,60,000
Subtotal:		**10,53,000**
Add	Profit expected	5, 26,500
Total:		15,79,500

Calculate the Number of Working Days:

Next, calculate the number of working days in a year as:

	Total Possible Working Days:
Deduct	Holidays
Deduct	Public Holidays
Deduct	Sickness, training, etc

Total:

Example:
Again as an example, if you have 25 days holiday each year, and live in a country that has 12 public holidays, then the number of working days is:

	Total Possible Working Days:	52 weeks x 5 = 260
Deduct	Holidays	25
Deduct	Public Holidays	12
Deduct	Sickness, training, etc	12
Total:		**212**

From these figures, calculate firstly a daily rate:

15,79,500/212 = Rs7450 / day

And then calculate an hourly rate:

7450 / 7.5 = Rs993 / hour!

If you are self-employed, use a similar approach to work out the hourly value of your time; however, make an appropriate allowance for the time that you will be marketing and selling your services and running your business.

Working through this calculation, you may be quite surprised how high the value of your time is!

Using This Figure:
This figure shows you the average value you should aim to deliver with your time if you aim to be a satisfactory performer. If you want to be a high achiever in your organization, you should aim to offer substantially better value than this.

In looking at your workload, think about a rough value of each of the things you do. Where possible, your aim should be to concentrate on tasks with a value greater than the calculated value of your time.

Respect for others

Respect for others is based on self-respect. It really is following the Golden Rule: Do unto others as you would have others do unto you. Being a polite and courteous person makes one a rare individual in today's world. Politeness, and a genuine concern for the rights and feelings of others in our society seems to have slammed the door in our faces. A culture of rudeness has become a feature of modern society. Whether it's loud cellphone conversations, line cutting, or terrible customer service by staff people, finding politeness in the world is on the decline.

You can very easily find people who view politeness and good manners as weakness and as character flaws to be overcome. They argue that rudeness succeeds and common courtesy is a mark of failure. They view rudeness to others as a sign of their superiority as people, and a badge of their status. They couldn't be more wrong. Politeness and common courtesy are more likely to achieve success, in business and in life, than a selfish, bullying attitude.

Whether in your personal relationships with others, or in your company, being polite and well mannered pays off in many ways. In your personal life, remembering special days, holding doors, and displaying good manners in general shows respect for the other person. That respect will almost always be reciprocated by the other person.

Word of your genuine concern, for treating others fairly and with respect, will improve your company's public image dramatically. Customers and clients will refer your business to their friends and family, resulting in even more personal referrals. Good old fashioned word of mouth advertising, through testimonials from satisfied customers is a powerful marketing tool. Everyone wants to be treated with respect, and in the modern decline of manners, your business politeness will shine like a beacon in the darkness.

Contrary to the criticism that good manners are a display of weakness, polite and respectful actions are a sign of self confidence. They are also recognition that everyone deserves to be treated with dignity. Instead of taking their money and running, missing their appointments, or barging past them in lineups, you are showing you value their time and rights, as well your own.

In a world where good manners are in steep decline, your polite actions will help you to stand out. You definitely won't be seen as a doormat. There is a huge difference between providing service and being subservient. Service implies an equal respect for yourself and others. Being subservient is based on a lack of self respect, and has nothing to do with being polite. Show your respect for yourself and others. Display your good manners today.

Peaceful living:

Our principle of **'Peaceful living'** centers on the ethical and sustainable application of technologies which would aim to provide basic needs for everyone without compromising the planet's resources. Living in peace is about living harmoniously with yourself, others, and all sentient beings around you. Living in peace is both an outward and an inward process. Outwardly, living in peace is a way of life in which we respect and love each other in spite of our cultural, religious, and political differences. Inwardly, we all need to search our hearts and minds and understand the fear that causes the impulse to violence, for in continuing to ignore the rage within, the storm outside will never subside.

While you will find your own meanings of peaceful existence and outward manifestations of a peaceful life according to your beliefs and lifestyle, there are some basics underpinning living in peace that cannot be overlooked, such as being non-violent, being tolerant, holding moderate views, and celebrating wondrous-life. This article provides some suggestions to help you to discover your journey to living in peace, a journey and way of life that ultimately only you can be responsible for.

Ceasing to seek power over people and outcomes in your life is the first major step to living peacefully. Trying to control people is about seeking to impose your will and reality on others without ever trying to see their side of things. A controlling approach to relationships will keep you in conflict with others. Replacing a will to control with a broad approach of loving others instead, including their faults and differences, is the way to a peaceful life.

1. Seek to love, not control others.

- Think peace before power. Gandhi said that power based on love is a thousand times more effective and permanent than the power gained through threat of punishment. If you've learned to "control" other people through threatening behavior, demeanor, or actions, those persons subjected to your power will be responding out of coercion, not out of respect or care for you. This is not a peaceful way to live.

- Learn the skills of negotiation, conflict resolution, and assertive communication. These are important, constructive communication skills that help you to avoid or effectively move through conflict with others. Not all conflict can be avoided, and not all conflict is bad provided you know how to handle it skilfully. If you don't feel that you have enough skills in these forms of communication, read widely on ways to improve them. The clarity of the message is always vital to ensure peace, as much conflict arises out of misunderstandings.
- When communicating with others, seek to avoid ordering, moralizing, demanding, threatening, or excessively needling them with questions aimed at eliciting too much information. Each of these forms of communication will give rise to conflict with others who feel that you're trying to control them rather than speak with them as an equal.
- Have confidence that others around you are capable of living as good a life as possible all things being equal. In this respect, even giving advice carries controlling tendencies when you use advice as a means to interfere in another person's life, rather than simply offering your own insights without an expectation they'll act on what you think. The Swedish diplomat Dag Hammerskjold once said: "Not knowing the question, it was easy for him to give the answer." When we advise others, we risk assuming that we have a full grasp of the problems they're facing when, in actual fact, we usually do not and we're filtering their problem from our own experience. It is far better to respect the other person's intelligence and simply be there for them, instead of trying to impose your experience as the "answer" for them. In this way, you will cultivate peace over resentment, respect over trivialization of their viewpoint, and confidence in their intelligence instead of insulting them.

2. **Moderate your convictions**.

3. **Be tolerant**

4. **Be peaceful**. Gandhi said "There are many causes that I am prepared to die for but no cause that I am prepared to kill for."

5. **Reflect**

6. Seek forgiveness, not revenge.

7. **Find inner peace**

8. Live in joy

9. **Be the change you wish to see in the world**

10. **Broaden your understanding of peace**.

Sustainability

Sustainability can be expressed as meeting present ecological, societal, and economical needs without compromising these factors for future generations. Sustainable design encompasses the development of appropriate technology which is a staple of sustainable living practices. Sustainable development in turn is the use of these technologies in infrastructure. Evidence from the earliest hominid remains suggest that one of the keys to the divergence of Homo Sapiens from apes came about through an increasing and varied use of tools. Tool complexity eventually became more and more complex, finally evolving into the myriad of technologies we rely on today. It would appear therefore that whilst there are humans there will always be the development of technologies to shape the world we live in.

Sustainability is the capacity to endure. In ecology the word describes how biological systems remain diverse and productive over time. Long-lived and healthy wetlands and forests are examples of sustainable biological systems. For humans, sustainability is the potential for long-term maintenance of well being, which has ecological, economic, political and cultural dimensions. Sustainability requires the reconciliation of environmental, social equity and economic demands - also referred to as the "three pillars" of sustainability or (the 3 Es).

Healthy ecosystems and environments are necessary to the survival and flourishing of humans and other organisms. There are a number of major ways of reducing negative human impact. The first of these is environmental management. This approach is based largely on information gained from earth science, environmental science and conservation biology. The second approach is management of human consumption of resources, which is based largely on information gained from economics. A third more recent approach adds cultural and political concerns into the sustainability matrix.

Sustainability interfaces with economics through the social and environmental consequences of economic activity. Sustainability economics involves ecological economics where social aspects including cultural, health-related and monetary/financial aspects are integrated. Moving towards sustainability is also a social challenge that entails international and national law, urban planning and transport, local and individual lifestyles and ethical consumerism. Ways of living more sustainable can take many forms from reorganizing living conditions (e.g., ecovillages, eco-municipalities and sustainable cities), reappraising economic sectors (permaculture, green building, sustainable agriculture), or work practices (sustainable architecture), using science to develop new technologies (green technologies, renewable energy and sustainable Fission and Fusion power), to adjustments in individual lifestyles that conserve natural resources.

Ethics of technology

The Ethics of Technology is a sub-field of Ethics and generally sub-divided into two areas:

- The ethics involved in the development of new technology – whether it is always, never, or contextually right or wrong, to invent and implement a technological innovation.
- The ethical questions that are exacerbated by the ways in which technology extends or curtails the power of individuals – how standard ethical questions are changed by the new powers.

In 1998 UNESCO set up its **Ethics of Science and Technology Programme** which aims 'to promote consideration of science and technology in an ethical framework by initiating and supporting the process of democratic building.'

Likewise The Centre for Technology and Ethics is a collaboration of three universities in the Netherlands (Delft, Eindhoven, Twente) which aims:

- To stimulate and undertake interdisciplinary and applied research in the field of ethics and technology;
- To stimulate and undertake fundamental research in ethics relevant for the field of ethics and technology;
- To stimulate and undertake activities in the field of teaching in ethics and technology;
- To act as an intermediary between the philosophy departments involved in the three universities. Ethics on the one hand and public debates and the media on the other.

Honesty

Honesty refers to a facet of moral character and connotes positive and virtuous attributes such as integrity, truthfulness and straightforwardness along with the absence of lying, cheating or theft.

Honesty is revered in many cultures and religions. Honesty means being truthful, trustworthy, loyal, fair and sincere. Honesty also means straight forward conduct.

"Honesty is the best policy" is a proverb of unknown origin. "Honesty is the first chapter in the book of wisdom."- Thomas Jefferson.

It's been said that honesty is the best policy. It sounds like the simplest thing in the world, but being truly honest with others and with yourself can be a real challenge. Political correctness, being sensitive of other people's feelings, and facing uncomfortable truths about you usually requires lots of patience, vigilance and hard work.

Understand the workings of dishonesty. Most of us learned to be dishonest as children. The process often began with the realization that different behaviors result in different outcomes. For example, saying certain things (or *not* saying certain things) garnered desirable approval and praise, or the undesirable disapproval and censure, if not punishment. Indulgence in dishonest behavior to get desired results was just a small step away. With time the thought processes behind such actions get so entrenched in our subconscious mind that one is not even aware of them. A time comes when one loses the capacity to know when and where to draw the line and how negatively does dishonesty affect our lives (see Warnings below). Dishonesty often becomes a tool to:

- Pretend that there is nothing wrong with us.
- Shift blame to others.
- Avoid embarrassment.
- Distract ourselves.
- Minimize conflict.
- Avoid responsibility or work.

Be willing to address issues where you have been less than honest in the past, whether you took a cookie and then denied it, or blatantly lied about whose fault an automobile accident was. While reviewing your past transgressions can create discomfort and guilt, recognizing where you have been dishonest in the past can help you identify patterns and stop them from continuing.

- If you feel guilty for having been dishonest in the past, apologize to the person you lied to and/or find a creative way to make things right. For example, if you kept money that you knew wasn't yours and didn't make a good faith effort to return it to its owner, make an effort to locate the owner and return an equivalent or greater amount or, if you cannot locate the owner after trying, make a donation to charity for an equivalent or greater amount. If you've lied to a person who plays an important role in your life (a significant other, relative, or friend) the best (but most difficult) thing to do is to come clean.
- List the areas where you may have a weakness. It may be as simple as a tendency to make up excuses for failures, or as complicated as a penchant for stealing. Remember that dishonesty is rooted in fear, so you must look for and face those fears. By listing areas where you have a problem, and then working to deal with them, you can consciously battle these habits. If you find yourself lying because you fear disapproval from someone, for example, perhaps you need to learn how to stop being a people pleaser and be yourself. Most importantly, admit your errors so that you can forgive yourself and use those experiences to reinforce your determination to do better. You can't fix what you don't acknowledge as a problem.
- Being honest really can be truly hard, but to be a stronger person we need to except that before we become honest we need to put all our mistakes out on the table. There for you can answer their questions about you're fowl long mistakes.
- For most people, keeping secrets intended to benefit someone is not considered dishonest, as long as you're confident that the person you're keeping the secret from will completely

understand when they find out. Still, it's a fuzzy line determining which secrets are dishonest—keeping a surprise birthday party under wraps is one thing; not telling a child that they are adopted or that their pet has died is trickier, and will require a personal sorting of ethics.

- We make judgments, assumptions and theories every day, but in order to be honest, it's important for us to acknowledge them as what they are: ideas about what the truth might be, not the hard truth itself. When you make a statement, try to add the phrase "In my experience..." or "Personally, I've observed that..." at the beginning, or end it with "...but that's just my observation/experience, that might not be how things are everywhere". For example: "In my experience, people who have physically demanding jobs tend to be more fit than those in office jobs, but that's just my own observation. That might not be how things are everywhere." It lets people know that you are making an observation that is limited to your situation, instead of making a blanket statement (i.e. stereotype or generalization) that isn't true.
- Some may find it helps to keep track of your statements to others in written form (a journal or chart of some sort). This can help you to see how many times you are honest and how many times you are dishonest. Learn from these experiences. Having a record of past situations where you were dishonest can help you to consider what can you do better in future situations. Visualize how it will be if you are honest and then let move forward confidently!
- If someone pressures you into telling the truth about something you did, say something along the lines of "I did it without thinking. I was wrong to do so. But I know I made a mistake, so I will be better now! Please give me another chance to show you I didn't mean it and that I can be a good friend".
- Keep these words of wisdom in mind:
    - "Never do something you will have to lie about later. If you have to lie about it, you shouldn’t be doing it."
    - "Son, always tell the truth. Then you'll never have to remember what you said the last time." Sam Rayburn (1882 - 1961), quoted Washingtonian, November 1978
    - "A half truth is a whole lie." Yiddish Proverb
    - "Truth fears no questions." Unknown
    - "The cruelest lies are often told in silence." Adlai Stevenson
    - "Oh what a tangled web we weave, When first we practice to deceive" Sir Walter Scott

Commitment and cooperation:

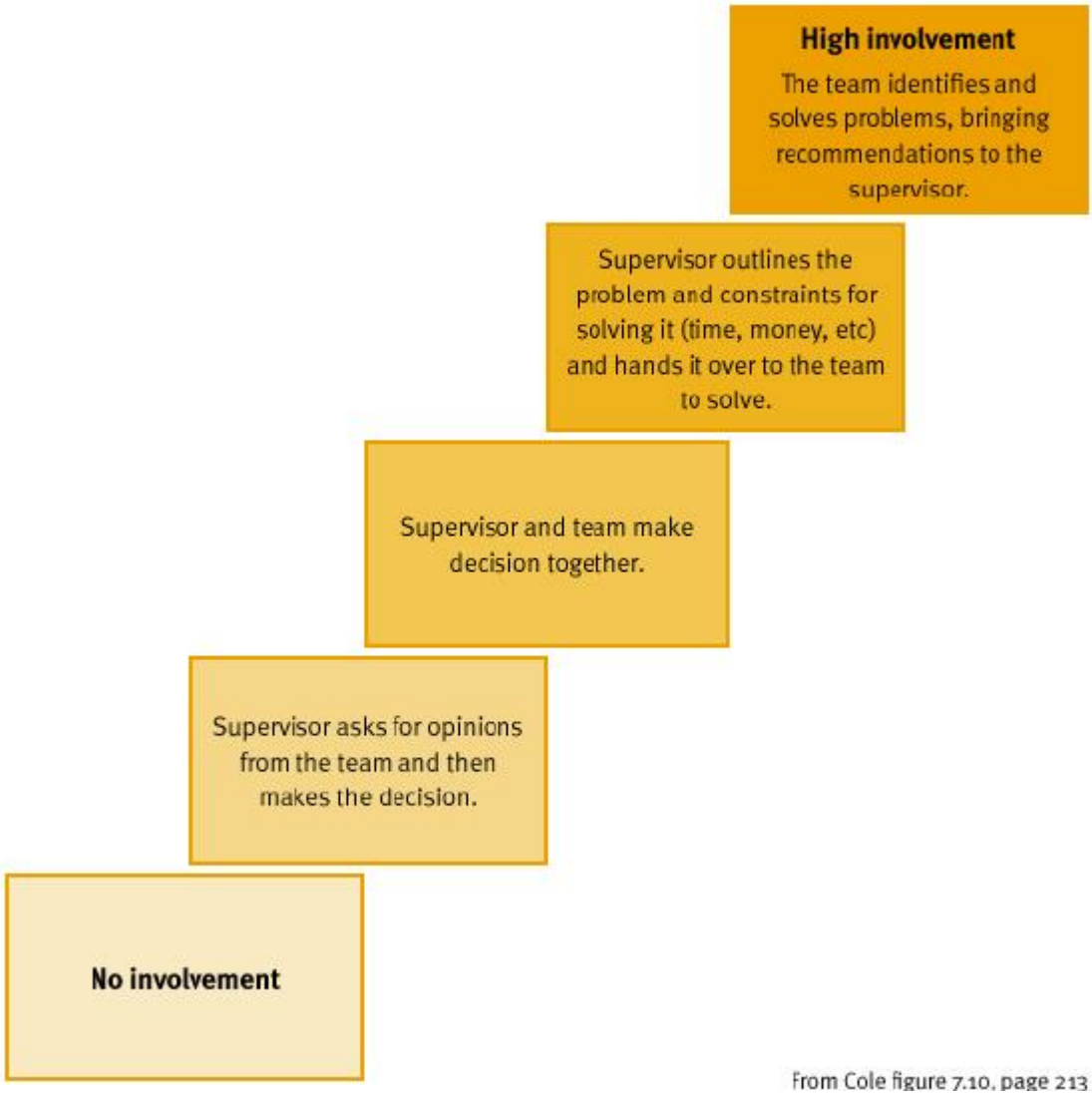
Commitment means acceptance of the responsibilities and duties and cooperation means help and assistance. By developing team commitment and cooperation in a work team you are assisting the team to meet its goals and objectives. Work teams that are committed and cooperative are more likely to achieve the goals the business has set.

There are a number of signals that indicate the work team is committed and cooperating. These include:

- maintaining or increasing quality
- reaching or exceeding production targets
- decreasing complaints from team members
- limited conflict between team members
- fewer workplace injuries.

There are degrees of team involvement in decision making. Your knowledge of the skills and abilities of the team members will guide your decision about the extent supported employees can contribute to

making a decision. There are no rules for when and how team members should be involved. It is a matter for your judgment. The following diagram shows the degrees of involvement team members may have. At the highest level of involvement the team identifies and solves problems, and brings recommendations to the supervisor. At the lowest level of involvement the team plays no role in the decision making at all. Between these two extremes the supervisor and team may make the decision together, or the supervisor may outline the problem and constraints for solving it (time, money, etc) and hand it over to the team to solve.



From Cole figure 7.10, page 213

Involving team members in decision making, which can include problem solving, should be based on whether one or more of the following is met:

- The need for acceptance. The greater the need for the team to accept your decisions, the more you should involve them.
- The effect the decision will have on the team. The more the problem or decision affects the team, the more you should involve them.
- Their involvement in implementing the decision. If the team will be implementing or carrying out the decision, involve them.

- The ability and desire of the group to become involved. If the team wants to be involved, consider involving them, particularly if they have sufficient knowledge or expertise in the issue involved. Even if they do not, it could be useful for training and development purposes.

Empathy

Empathy is the ability to mutually experience the thoughts, emotions, and direct experience of others. The ability to understand another person's circumstances, point of view, thoughts, and feelings is empathy. When experiencing empathy, you are able to understand someone else's internal experiences. Empathy has many different definitions that encompass a broad range of emotional states, from caring for other people and having a desire to help them, to experiencing emotions that match another person's emotions, to knowing what the other person is thinking or feeling, to blurring the line between self and other. Since empathy involves understanding the emotional states of other people, the way it is characterized is derivative of the way emotions themselves are characterized. If, for example, emotions are taken to be centrally characterized by bodily feelings, then grasping the bodily feelings of another will be central to empathy. On the other hand, if emotions are more centrally characterized by a combination of beliefs and desires, then grasping these beliefs and desires will be more essential to empathy. The ability to imagine oneself as another person is a sophisticated imaginative process. However, the basic capacity to recognize emotions is probably innate and may be achieved unconsciously. Yet it can be trained and achieved with various degrees of intensity or accuracy.

Self-confidence

Self-confidence relates to self-assuredness in one's personal judgment, ability, power, etc., sometimes manifested excessively.[1] Being confident in yourself is infectious if you present yourself well, others will want to follow in your foot steps towards success.

Promise yourself, no matter how difficult the problem life throws at you, that you will try as hard as you can to help yourself. You acknowledge that sometimes your efforts to help yourself may not result in success, as often being properly rewarded is not in your control.

Self-esteem has been directly connected to an individual's social network, the activities they participate in, and what they hear about themselves from others. Positive self-esteem has been linked to factors such as psychological health, mattering to others, and both body image and physical health. On the contrary, low self-esteem has been associated with the outcomes of depression, health problems, and antisocial behavior. Usually, adolescents of poor health will display low self-esteem. Globally, self-confidence in boys and girls will decline during adolescence, and in contrast to boys, girls' self-confidence won't shoot back up again until early adulthood.

During adolescence, self-esteem is affected by age, race, ethnicity, puberty, health, body height, body weight, body image, involvement in physical activities, gender presentation, gender identity, and awakening or discovery of sexuality. Self-confidence can vary and be observed in a variety of dimensions. Components of one's social and academic life affect self-esteem. An individual's self-confidence can vary in different environments, such as at home or in school.

Spirituality:

Spirituality is the concept of an ultimate or an alleged immaterial reality, an inner path enabling a person to discover the essence of his/her being; or the "deepest values and meanings by which people live.

Spiritual practices, including meditation, prayer and contemplation, are intended to develop an individual's inner life. Spiritual experiences can include being connected to a larger reality, yielding a more comprehensive self; joining with other individuals or the human community;

with nature or the cosmos; or with the divine realm. Spirituality is often experienced as a source of inspiration or orientation in life. It can encompass belief in immaterial realities or experiences of immanent or transcendent nature of the world.

Traditionally, many religions have regarded spirituality as an integral aspect of religious experience. Among other factors, declining membership of organized religions and the growth of secularism in the western world have given rise to a broader view of spirituality. The term "spiritual" is now frequently used in contexts in which the term "religious" was formerly employed; compare James 1902 lectures on the "Varieties of Religious Experience".

Secular spirituality emphasizes humanistic ideas on moral character (qualities such as love, compassion, patience, tolerance, forgiveness, contentment, responsibility, harmony, and a concern for others) - aspects of life and human experience which go beyond a purely materialist view of the world without necessarily accepting belief in a supernatural reality or divine being. Spiritual practices such as mindfulness and meditation can be experienced as beneficial or even necessary for human fulfillment without any supernatural interpretation or explanation. Spirituality in this context may be a matter of nurturing thoughts, emotions, words and actions that are in harmony with a belief that everything in the universe is mutually dependent; this stance has much in common with some versions of Buddhist spirituality. A modern definition is as follows:

"Spirituality exists wherever we struggle with the issues of how our lives fit into the greater scheme of things. This is true when our questions never give way to specific answers or give rise to specific practices such as prayer or meditation. We encounter spiritual issues every time we wonder where the universe comes from, why we are here, or what happens when we die. We also become spiritual when we become moved by values such as beauty, love, or creativity that seem to reveal a meaning or power beyond our visible world. An idea or practice is "spiritual" when it reveals our personal desire to establish a felt-relationship with the deepest meanings or powers governing life."

Engineering as social experimentation:

'To undertake a great work, and especially a work of a novel type, means carrying out an experiment. It means taking up a struggle with the forces of nature without the assurance of emerging as the victor after the first attack'. Louis Marie Henri Navier (1785 – 1836)

The objective of engineering is to solve problems using technology which often involves unknowns like

- uncertain outcome
- monitor, learn from past experiments
- human subjects / participants often unaware, uninformed
- often don't recognize all variables
- natural experiment

Experimentation on the hand has the objective of new knowledge or answers which also involves

- uncertain outcome, test hypothesis
- draw conclusions or verify hypothesis based on experience / evidence
- "informed consent" of subjects
- try to control all variables
- controlled experiment

Experiments are carried out in partial ignorance when outcomes are uncertain like when engineers are asked to make things work without all the available scientific knowledge(including that

about humans), safety facts, environment, health, social influences, etc. or when Good design relies on information gathered before and
after a product leaves the factory especially when the product is tested in its true "environment," not fake ones used to simulate the real environment (e.g., temperature cycling electronic products)

Role of Experimentation in the Design Process:

- Preliminary tests or simulations of concepts
- Components and modules tested prior to detailed design
- Cycle of test and modification through production
- Beyond specific elements of design, each project taken in a totality can be viewed as an experiment

Contributors to Experimental Nature of Projects:

- Project carried out in partial ignorance
  - Parts functionality & availability
  - Luxury of waiting until all relevant facts are in not available (ability to work with partial knowledge is one talent crucial to an engineer's success)
- Outcomes of projects are generally uncertain
  - Unknown risk may attend even a seemingly benign project
- Effective engineering depends on knowledge gained both before and after products are released
  - Monitoring cannot be limited to in-house development

Informed Consent:

- Keystone of properly conducted experiments involving human subjects
- Main elements:
  - Volunteerism: absence of force, fraud, or deception
  - Knowledge: all the information needed to make a reasonable decision (not just what they request)
  - Competence: consenter is competent to process the information and make rational decisions

Morally Responsible Engineers as Social Experimenters:

- A primary obligation to protect the safety of human subjects and respect their right of consent
- A constant awareness of experimental nature of any project, forecasting and monitoring side effects
- Autonomous, personal involvement in all steps of a project
- Accepting accountability for the results of a project

How this Earmarks a "Style" of Engineering:

- Conscientiousness – people act responsibly to the extent that they conscientiously commit themselves to live according to moral values.
  - Moral values transcend a consuming preoccupation with narrowly conceived self-interest
  - A sense of awareness is implied
  - A role as a social guardian but not to suggest that engineers force, paternalistically, their own views of the social good upon society
- Relevant Information – conscientiousness blind without factual information
  - Moral concern involves a commitment to obtain and properly assess all available information
  - Obligation to grasp the context (uses) of one's work
  - Since our vision is limited and projects are experimental, ongoing monitoring is crucial
- Moral Autonomy – authenticity in moral conduct and principles

  - Kant: Moral beliefs and attitudes held on the basis of critical reflection rather than passive adoption
  - Commitment to action (not abstract or merely verbal)
  - Professional Societies such as IEEE can be a source of employee moral support
- Accountability – acceptance of moral responsibility for their actions
  - Willing to submit one's actions to moral scrutiny
  - Open and responsive to assessment of others
  - Willing to present morally cogent reason for one's conduct
  - Resistant to a narrowed sense of accountability when working under external authority that may promote fragmentation, diffusion, meeting schedules, and limited roles

Commitment to Safety

A thing is safe if, were its risks fully known, those risks would be judged acceptable by a reasonable person in light of settled value principles.

Examples:

- Computers:
  - Developed & adopted over about three decades
  - Significant impacts on society:
    - Not well understood or nor always predicted, e.g:
      - The Y2K bug
  - However largely accepted as a positive technology
- Nuclear power stations
  - Developed & adopted over about three decades
  - Significant impacts on society:
    - Not well understood nor always predicted, eg. Chernobyl
  - Widespread concern & installed capacity in decline

Experimental Attributes of Engineering:

- Incomplete understanding of implications:
  - Insufficient time or money
  - Commercial advantage (desire for secrecy)
  - Uncertainty about impacts (sometimes unknowable)
- Participation of experimental subjects:
  - Products or services often target non-engineers
  - Subjects share responsibility if voluntarily accept risk
- Reasons for monitoring outcomes:
  - Commercial purposes (e.g. product improvement)
  - Precautionary purposes (e.g. manage risk)

Nature of Subjects

- Subjects:
  - Individual consumers, groups or society as a whole:
    - Those who can make informed choices, and
    - Those requiring advocates:
      - Disadvantaged, future generations, other species & the environment
- Impacts:
  - Health, safety & the environment
  - Changes to social structure & social status:
    - Income & wealth distribution
    - Lifestyles & personal empowerment
    - Education, culture

Features

- Absence of a 'control group' (equivalent non-participants):
  - Products & services usually offered to all
  - Benefits may such that they can't be withheld from a particular group
- Society may have little prior understanding:
  - Innovative products & services
  - Uncertainty in future impacts (positive or negative)
- Informed judgements are difficult to make:
  - For both experimenter and subject

Summary

- Engineering is a form of social experimentation:
  - Innovation with social & environmental impacts
  - Uncertainty & risk in outcomes
- Stakeholders have a right to informed consent:
  - Information, opportunity, decision making capability
- Problems in implementation:

Case studies (from students) for Engineering as Social Experimentation

Software Student: "I was involved in designing and testing network communication software. Some tests were still being run when clients requested the software. We were unable to finish the tests, and gave the product to the customer knowing that the system caused lock-ups and loss of data. We then used the feedback from these clients to debug the software, and repeated the process." Similar student case: "In software engineering I have encountered problems in that the time required for testing the product and the
deadline for testing may conflict, and some parts of the testing may have to be compromised to meet those deadlines.

Computer testing Student: "On a recent co-op job my company had just shipped its latest and greatest computer product. After a few months in the field it was found to vastly lack the processor power it needed to do what it claimed to do. The fix that followed had to have the shortest turn around time I had ever seen. The fix was top quality, but the damage had been done. A full scale test, or even simulation, would have predicted this problem before shipping." What should the co-op do? Trust specifications of other's subcomponents?

Meeting specifications

Student: "At my co-op position I was placed in a design team to create an audio system. The project was a classic example of marketing wanting the product so bad that time lines were regarded higher than the quality of the product. The audio system's first prototypes arrived with many problems, some of which could not be resolved until after the product was released. It basically came down to the decision of letting the consumers find all the problems, and then hoping that the management would provide the team with more time and funding to fix the problems, to try to keep the customers happy." What to do?

Environment Student: "A turbidity meter was used to monitor if contaminants were getting into the water that goes into the river. When those meters failed to alarm us, and a white pigment went into the river, my project that focused on redesigning the monitoring station was given support." Can/should the engineer do anything? Creative solutions?

Environment...Student: "In wastewater treatment plants, control systems are tested in the field. The control systems are designed according to specifications and ISA/IEEE rules, but the testing of how the systems will operate under real life situations is done after installing them. Two questions arise, then:

first, can the plant design withstand additional rain, population increases, weather problems, etc? Second, can the control system adequately analyze these new factors and operate the plant successfully? If anything fails, the great danger is the release of raw sewage/sludge and bacteria onto land and into the water supply." What can the engineer do? Will competence solve the problem?

Law, minimal compliance...Student: "My problem came with a company involved in the design and manufacturing of PC power supplies. Some manufacturing organizations have focused on 100% minimal compliance and hence substituted parts to achieve their cost objectives. This resulted in unsafe final consumer products. An industry pushes for CSA and UL certification of power supply modules enhanced the minimal level achieved for standard sub assemblies. Since the FCC and FTC act as police organizations, it is not usually known that there is a problem until much mayhem occurs. When other companies began selling
"smoking PCs" the industry began to push to use only modules which would meet UL and CSA standards. The minimalists were forced to up the ante or lose considerable business."

A balanced outlook on Law

The 1969 Santa Barbara offshore spill of 235,000 gallons of crude oil blackened 30 miles of spectacular beaches, damaged wildlife, and hurt the local tourist trade. Predictably, the disaster prompted demands for new laws and tighter controls to prevent such occurances in the future. A group of Southern Californians staged a burning of gasoline credit cards of the offending oil company. Union oil is only to be taken to task by a local newspaper for taking the wrong aim. The newspaper argued that gas station operators who would suffer the most by a boycott are not at fault.

One may learn some on-the-job. One may likely to learn some "industrial standards," some of which directly pertain to safety. Tendency toward more detail will be lacking. Is minimal compliance morally acceptable? What about push of new technologies? Areas where there is no law? Government/law can be too detailed - can squash moral autonomy of engineers. We may have to look for good balance.
Some times judges and government agencies interpret law: After offshore oil spills in Santa Barbara in 1969:

- the spills caused damage to the beaches and sea life
- was it the fault of federal authorities for lack of enforcement?
- was it the drillers fault for not following laws?

The drillers argued that they did follow the law and should not be penalized. Hickel, a federal official, interpreted the law differently and was harsh to the drillers. He wanted to get the drillers attention. He was mad at the drillers. He said you have to 'hit the polluters hard so they don't pollute again' .

That is Hickel's law : 'hit the polluters hard so they don't do it again'. Hickel's law gives extra harsh penalty to get attention and avoid others doing the same thing. It allows protection for those that can not protect themselves.
Why is Hickel's law important?

- in this case it is protection for the environment and local beaches and sea life
- the drillers met the minimum requirement, but the federal officials were still mad about the embarrassment caused to them by the accident
- the drillers were penalized.
- it is an example of why the minimum compliance is sometimes not enough
- other terms for minimum compliance could be: following the minimum standard, minimum law, or minimum requirement

Minimum compliance - what does it mean?

- someone follows the law, but doing not more than is required
- doing the minimum in order to not break the law,
- satisfying the minimum requirement,
- following the minimum standard
- examples of the Tampa Bay Bridge, Titanic, Hickle's Law, McPherson case illustrate why the law, or minimum compliance, is not enough
- minimum compliance makes companies risk being subject to 'Hickle's Law
- old attitudes such as 'buyer beware' are consistent with thought about following the 'minimum requirement' or 'minimum compliance'

Code of ethics:

Ethical codes are adopted by organizations to assist members in understanding the difference between 'right' and 'wrong' and in applying that understanding to their decisions. An ethical code generally implies documents at three levels: codes of business ethics, codes of conduct for employees, and codes of professional practice.

Code of ethics for any profession is a guide of principles designed to help professionals conduct business honestly and with integrity. A code of ethics document may outline the mission and values of the business or organization, how professionals are supposed to approach problems, the ethical principles based on the organization's core values and the standards to which the professional will be held. A statement encompassing the set of rules based on values and the standards of conduct to which practitioners of a profession are expected to conform can become a code of ethics. Ethics code is generally different from code of conduct pertaining to discipline and personal moral behavior. Both are distinct but can overlap.

NSPE CODE OF ETHICS FOR ENGINEERS
*(**NSPE**: **N**ational **S**ociety of **P**rofessional **E**ngineers)*

Preamble

Engineering is an important and learned profession. As members of this profession, 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. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

I. Fundamental Canons

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health, and welfare of the public.
2. Perform services only in areas of their competence.
3. Issue public statements only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness

Topics covered in Unit 1:

- Objectives of studying 'Engineering Ethics'
- Scope- engineering & ethics
- Human values – morals, values & ethics
- Integrity, Honesty
- Work ethic
- Civic virtue
- Peaceful living
- Service learning
- Valuing time
- Empathy
- Self-respect & respect for others
- Spirituality
- Cooperation & commitment
- Engineering as social experimentation
- Balanced outlook on law
- Sample code of ethics, NSPE code

Likely questions in Unit 1

1. What are the objectives of studying 'engineering ethics'?
2. Distinguish between ethics & morals?
3. What do you understand by 'valuing time'?
4. How does self-confidence help an engineer?
5. 'Engineers are social experimenters', justify?
6. What do you understand by Integrity & Honesty?
7. Explain work ethic?
8. Discuss civic virtue?
9. Bring out the difference between cooperation and commitment?
10. What factors help in peaceful living?
11. Give a sample ethics code?
12. What do you understand by balanced outlook on law?

Professional Ethics and Values in Engineering (HS317)

Unit 2: Ethical Theories- Philosophical point of view- Moral issues and reasoning - Indian, Utilitarian and Aristotelian theories –duties, rights and virtues- Engineers, Managers, Heads and consultants and their role, Engineering Ethics - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

Ethical theories

Independently propounded ethical theories are many and are very diverse in nature.

Philosophical point of view of ethical theories

Deontology

Deontological ethics or deontology (from Greek δέον, *deon*, "obligation, duty"; and -λογία, *-logia*) is an approach to ethics that determines goodness or rightness from examining acts, or the rules and duties that the person doing the act strove to fulfill. This is in contrast to consequentialism, in which rightness is based on the consequences of an act, and not the act by itself. In deontology, an act may be considered right even if the act produces a bad consequence, if it follows the *rule* that "one should do unto others as they would have done unto them", and even if the person who does the act lacks virtue and had a bad intention in doing the act. According to deontology, we have a *duty* to act in a way that does those things that are inherently good as acts ("truth-telling" for example), or follow an objectively obligatory rule (as in rule utilitarianism). For deontologists, the ends or consequences of our actions are not important in and of themselves, and our intentions are not important in and of themselves.

Immanuel Kant's theory of ethics is considered deontological for several different reasons. First, Kant argues that to act in the morally right way, people must act from duty (*deon*). Second, Kant argued that it was not the consequences of actions that make them right or wrong but the motives (maxime) of the person who carries out the action.

Kant's argument that to act in the morally right way, one must act from duty, begins with an argument that the highest good must be both good in itself, and good without qualification. Something is 'good in itself' when it is intrinsically good , and 'good without qualification' when the addition of that thing never makes a situation ethically worse. Kant then argues that those things that are usually thought to be good, such as intelligence, perseverance and pleasure, fail to be either intrinsically good or good without qualification. Pleasure, for example, appears to not be good without qualification, because when people take pleasure in watching someone suffering, this seems to make the situation ethically worse. He concludes that there is only one thing that is truly good:

Nothing in the world—indeed nothing even beyond the world—can possibly be conceived which could be called good without qualification except a *good will*.

Kantian ethics are deontological, revolving entirely around duty rather than emotions or end goals. All actions are performed in accordance with some underlying maxim or principle, which are deeply different from each other; it is according to this that the moral worth of any action is judged. Kant's ethics are founded on his view of rationality as the ultimate good and his belief that all people are fundamentally

rational beings. This led to the most important part of Kant's ethics, the formulation of the categorical imperative, which is the criterion for whether a maxim is good or bad.

Simply put, this criterion amounts to a thought experiment: to attempt to universalize the maxim (by imagining a world where all people necessarily acted in this way in the relevant circumstances) and then see if the maxim and its associated action would still be conceivable in such a world. For instance, holding the maxim *kill anyone who annoys you* and applying it universally would result in a world which would soon be devoid of people and without anyone left to kill. Thus holding this maxim is irrational as it ends up being impossible to hold it.

Universalizing a maxim (statement) leads to it being valid, or to one of two contradictions — a contradiction in conception (where the maxim, when universalized, is no longer a viable means to the end) or a contradiction in will (where the will of a person contradicts what the universalization of the maxim implies). The first type leads to a "perfect duty", and the second leads to an "imperfect duty."

Kant's ethics focus then only on the maxim that underlies actions and judges these to be good or bad solely on how they conform to reason. Kant showed that many of our common sense views of what is good or bad conform to his system but denied that any action performed for reasons other than rational actions can be good (saving someone who is drowning simply out of a great pity for them is not a morally good act). Kant also denied that the consequences of an act in any way contribute to the moral worth of that act, his reasoning being (highly simplified for brevity) that the physical world is outside our full control and thus we cannot be held accountable for the events that occur in it.

The Formulation Rule of Kantianism:

1. Act only according to that maxim by which you can, at the same time, will that it would become a universal law.
2. Act so that you always treat others as an end, and never as a means to an end *only*.

Virtue ethics

Virtue ethics describes the character of a moral agent as a driving force for ethical behavior, and is used to describe the ethics of Socrates, Aristotle, and other early Greek philosophers. Socrates (469 BC – 399 BC) was one of the first Greek philosophers to encourage both scholars and the common citizen to turn their attention from the outside world to the condition of humankind. In this view, knowledge having a bearing on human life was placed highest, all other knowledge being secondary. Self-knowledge was considered necessary for success and inherently an essential good. A self-aware person will act completely within his capabilities to his pinnacle, while an ignorant person will flounder and encounter difficulty. To Socrates, a person must become aware of every fact (and its context) relevant to his existence, if he wishes to attain self-knowledge. He posited that people will naturally do what is good, if they know what is right. Evil or bad actions are the result of ignorance. If a criminal was truly aware of the mental and spiritual consequences of his actions, he would neither commit nor even consider committing those actions. Any person who knows what is truly right will automatically do it, according to Socrates. While he correlated knowledge with virtue, he similarly equated virtue with happiness. The truly wise man will know what is right, do what is good, and therefore be happy.

The essential features of virtue ethics

(a) An action is right if and only if it is what an agent with a virtuous character would do in the circumstances

(b) Goodness is prior to rightness.

(c) The virtues are irreducibly plural intrinsic goods.

(d) The virtues are objectively good.

e) Some intrinsic goods are agent-relative.

(f) Acting rightly does not require that we maximise the good

Claims (a) to (f) are made by all forms of virtue ethics, and the different varieties of the theory can be distinguished according to which of these claims they emphasise, and their reasons for making these claims. Some philosophers who do not (or at least, not explicitly) call themselves virtue ethicists nevertheless endorse one or more of these claims as part of their criticisms of Kantian, utilitarian, or consequentialist theories.
However, taken as a whole, these claims help show how virtue ethics constitutes a distinct alternative to familiar forms of Kantianism, utilitarianism, and consequentialism

Aristotle (384 BC – 322 BC) posited an ethical system that may be termed "self-realizationism." In Aristotle's view, when a person acts in accordance with his nature and realizes his full potential, he will do good and be content. At birth, a baby is not a person, but a potential person. To become a "real" person, the child's inherent potential must be realized. Unhappiness and frustration are caused by the unrealized potential of a person, leading to failed goals and a poor life. Aristotle said, "Nature does nothing in vain." Therefore, it is imperative for persons to act in accordance with their nature and develop their latent talents in order to be content and complete. Happiness was held to be the ultimate goal. All other things, such as civic life or wealth, are merely means to the end. Self-realization, the awareness of one's nature and the development of one's talents, is the surest path to happiness.

Aristotle asserted that man had three natures: vegetable (physical/metabolism), animal (emotional/appetite) and rational (mental/conceptual). Physical nature can be assuaged through exercise and care, emotional nature through indulgence of instinct and urges, and mental through human reason and developed potential. Rational development was considered the most important, as essential to philosophical self-awareness and as uniquely human. Moderation was encouraged, with the extremes seen as degraded and immoral. For example, courage is the moderate virtue between the extremes of cowardice and recklessness. Man should not simply live, but live well with conduct governed by moderate virtue. This is regarded as difficult, as virtue denotes doing the right thing, to the right person, at the right time, to the proper extent, in the correct fashion, for the right reason.

Consequentialism

Consequentialism refers to moral theories that hold that the consequences of a particular action form the basis for any valid moral judgment about that action (or create a structure for judgment, see rule consequentialism). Thus, from a consequentialist standpoint, a morally right action is one that produces a good outcome, or consequence. This view is often expressed as the aphorism *"The ends justify the means"*.

The term "consequentialism" was coined by G.E.M. Anscombe in her essay "Modern Moral Philosophy" in 1958, to describe what she saw as the central error of certain moral theories, such as those propounded by Mill and Sidgwick. Since then, the term has become common in English-language ethical theory.

The defining feature of consequentialist moral theories is the weight given to the consequences in evaluating the rightness and wrongness of actions. In consequentialist theories, the consequences of an action or rule generally outweigh other considerations. Apart from this basic outline, there is little else that can be unequivocally said about consequentialism as such. However, there are some questions that many consequentialist theories address:

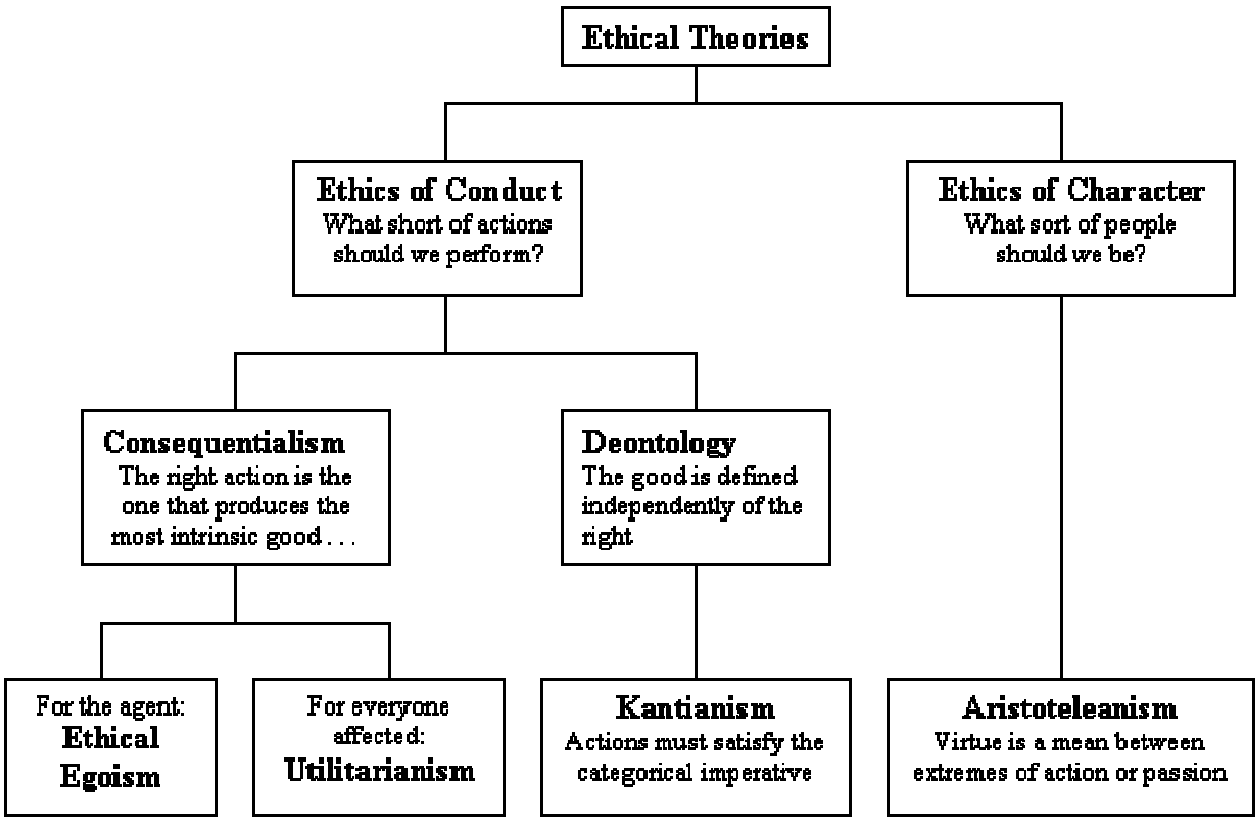
- What sort of consequences count as good consequences?
- Who is the primary beneficiary of moral action?
- How are the consequences judged and who judges them?

One way to divide various consequentialism is by the types of consequences that are taken to matter most, that is, which consequences count as good states of affairs. According to hedonistic utilitarianism, a good action is one that results in an increase in pleasure, and the best action is one that results in the most pleasure for the greatest number. Closely related is eudaimonic consequentialism, according to which a full, flourishing life, which may or may not be the same as enjoying a great deal of pleasure, is the ultimate aim. Similarly, one might adopt an aesthetic consequentialism, in which the ultimate aim is to produce beauty. However, one might fix on non-psychological goods as the relevant effect. Thus, one might pursue an increase in material equality or political liberty instead of something like the more ephemeral "pleasure". Other theories adopt a package of several goods, all to be promoted equally. Whether a particular consequentialist theory focuses on a single good or many, conflicts and tensions between different good states of affairs are to be expected and must be adjudicated.

Comparison of Ethical theories

	Consequentialism	Deontology	Virtue Theory
example	Mill's utilitarianism	Kantian ethics	Aristotle's moral theory
abstract description	An action is right if it promotes the best consequences.	An action is right if it is in accordance with a moral rule or principle.	An action is right if it is what a virtuous agent would do in the circumstances.
more concrete specification	The best consequences are those in which happiness is maximized.	A moral rule is one that is required by rationality.	A virtuous agent is one who acts virtuously, that is, one who has and exercises the virtues. A virtue is a character trait a human being needs to flourish or live well.

Classification of Ethical Theories



Philosophers have found ethical theories useful because they help us decide why various actions are right and wrong. If it is generally wrong to punch someone then it is wrong to kick them for the same reason. We can then generalize that it is wrong to "harm" people to help understand why punching and kicking tend to both be wrong, which helps us decide whether or not various other actions and institutions are wrong, such as capital punishment, abortion, homosexuality, atheism, and so forth.

All of the ethical theories have various strengths and it is possible that more than one of them is true (or at least accurate). Not all moral theories are necessarily incompatible. Imagine that utilitarianism, the categorical imperative, and Stoic virtue ethics are all true. In that case true evaluative beliefs (e.g. human life is preferable) would tell us which values to promote (e.g. human life), and we would be more likely to have an emotional response that would motivate us to actually promote the value. We would feel more satisfied about human life being promoted (e.g. through a cure to cancer) and dissatisfied about human life being destroyed (e.g. through war). Finally, what is right for one person would be right for everyone else in a sufficiently similar situation because the same reasons will justify the same actions.

Eastern or Indian theory of Ethics

The three western theories above are one-dimensional and narrow. A more broad-based, multi-dimensional ethical theory developed in India takes a unified approach to morality. It was developed by a good number of Hindu philosophers, who were inspired by the Bhagwad Gita.

Take an analogy from the world of religion. Religious monoism stands for only one true religion existing. But there are many religions and thus there are many true faiths varying from individual to individual. This is the theory of religious pluralism. Through this we come to the question that if there can be religious pluralism, then why not ethical pluralism? This is the argument by Hindu philosophers who say that there is no need to fight over ethical theories. Reason, duty, affection are all important parts of human nature, thus we must embrace all the theories instead of choosing any one of them.

So the non-western ethical perspective is to unite all perspectives, take a multi-dimensional approach. We as human beings are complex and need to include everything. Another analogy is that of a surgeon, who has to make choices everyday of his life and who can't follow only a single approach in his life.

Kohlberg's Theory of Moral Development

Moral development is a major topic of interest in both psychology and education. One of the best known theories was developed by psychologist Lawrence Kohlberg who modified and expanded upon Jean Piaget's work to form a theory that explained the development of moral reasoning.

Piaget described a two-stage process of moral development, while Kohlberg's theory of moral development outlined six stages within three different levels. Kohlberg extended Piaget's theory, proposing that moral development is a continual process that occurs throughout the lifespan.

"The Heinz Dilemma"

Kohlberg based his theory upon research and interviews with groups of young children. A series of moral dilemmas were presented to these participants and they were also interviewed to determine the reasoning behind their judgments of each scenario.

The following is one example of the dilemmas Kohlberg presented"

Heinz Steals the Drug

"In Europe, a woman was near death from a special kind of cancer. There was one drug that the doctors thought might save her. It was a form of radium that a druggist in the same town had recently discovered. The drug was expensive to make, but the druggist was charging ten times what the drug cost him to make. He paid $200 for the radium and charged $2,000 for a small dose of the drug.

The sick woman's husband, Heinz, went to everyone he knew to borrow the money, but he could only get together about $ 1,000 which is half of what it cost. He told the druggist that his wife was dying and asked him to sell it cheaper or let him pay later. But the druggist said: "No, I discovered the drug and I'm going to make money from it." So Heinz got desperate and broke into the man's store to steal the drug-for his wife. Should the husband have done that?".

Kohlberg was not interested so much in the answer to the question of whether Heinz was wrong or right, but in the *reasoning* for each participant's decision. The responses were then classified into various stages of reasoning in his theory of moral development.

Level 1. Preconventional Morality

- **Stage 1 - Obedience and Punishment**

The earliest stage of moral development is especially common in young children, but adults are also capable of expressing this type of reasoning. At this stage, children see rules as fixed and absolute. Obeying the rules is important because it is a means to avoid punishment.

- **Stage 2 - Individualism and Exchange**

At this stage of moral development, children account for individual points of view and judge actions based on how they serve individual needs. In the Heinz dilemma, children argued that the best course of action was the choice that best-served Heinz's needs. Reciprocity is possible at this point in moral development, but only if it serves one's own interests.

Level 2. Conventional Morality

- **Stage 3 - Interpersonal Relationships**

Often referred to as the "good boy-good girl" orientation, this stage of moral development is focused on living up to social expectations and roles. There is an emphasis on conformity, being "nice," and consideration of how choices influence relationships.

- **Stage 4 - Maintaining Social Order**

At this stage of moral development, people begin to consider society as a whole when making judgments. The focus is on maintaining law and order by following the rules, doing one's duty and respecting authority.

Level 3. Postconventional Morality

- **Stage 5 - Social Contract and Individual Rights**

At this stage, people begin to account for the differing values, opinions and beliefs of other people. Rules of law are important for maintaining a society, but members of the society should agree upon these standards.

- **Stage 6 - Universal Principles**

Kolhberg's final level of moral reasoning is based upon universal ethical principles and abstract reasoning. At this stage, people follow these internalized principles of justice, even if they conflict with laws and rules.

Criticisms of Kohlberg's Theory of Moral Development:

- Does moral reasoning necessarily lead to moral behavior? Kohlberg's theory is concerned with moral thinking, but there is a big difference between knowing what we *ought* to do versus our actual actions.
- Is justice the only aspect of moral reasoning we should consider? Critics have pointed out that Kohlberg's theory of moral development overemphasizes the concept as justice when making moral choices. Factors such as compassion, caring and other interpersonal feelings may play an important part in moral reasoning.
- Does Kohlberg's theory overemphasize Western philosophy? Individualistic cultures emphasize personal rights while collectivist cultures stress the importance of society and community. Eastern cultures may have different moral outlooks that Kohlberg's theory does not account for.

Gilligan's Theory

Gilligan was a student of Lawrence Kohlberg and Kohlberg applied Piaget's theory to the development of moral thinking. Borrowing from Piaget's "preoperational/concrete/formal" distinctions Kohlberg came up with the stage theory you see here.

Kohlberg Stages of Moral Development		
Approximate Age Range	**Stage**	**Substages**
Birth to 9	Preconventional	1) Avoid punishment 2) Gain Reward
Age 9 to 20	Conventional	3) Gain Approval & Avoid Disapproval 4) Duty & Guilt
Age 20+ maybe	Postconventional	5) Agreed upon rights

never		6) Personal moral standards

The pre-conventional moral stage, says Kohlberg, is based on the cognitive abilities of a person in Piaget's concrete operational stage. Moral decisions are egocentric (based on me) and concrete. So you can see how reward and punishment are the typical bases of reasoning in this stage.

The conventional stage is based on the children's ability to "decenter" their moral universe and take the moral perspective of their parents and other important members of society into account.

The post-conventional stage is based on the adult's ability to base morality on the logic of principled decision making based on standards that are thought to be universalizable and not dependent on culture. Kohlberg's system was based on extensive research he and his students did with interviews in which they asked children and adults to give the reasons they had for moral decisions Kohlberg presented them with. So his stages and ages do not correspond exactly from Piaget, but you can see a tantalizing similarity.

Now we finally get to Gilligan. As a student of Kohlberg's, Gilligan was taken by the stage theory approach to understanding moral reasoning. But she disagreed with her mentor's assessment of the content of the moral system within which people developed. If you look at the table of Kohlberg's stages, you can see the question being answered in the third column is one of justice - the fourth stage gives this away with talk about duty and guilt. "What are the rules of the game?" seems to be the issue at hand. From her careful interviews with women making momentous decisions in their lives, Gilligan concluded that these women were thinking more about the caring thing to do rather than the thing the rules allowed. So she thought Kohlberg was all wet, at least with regard to women's development in moral thinking.

What set her off in thinking this was the fact that in some of Kohlberg's investigations, women turned out to score lower - less developed - than did men. Were women really moral midgets? Gilligan did not think so. In taking this stand, she was going against the current of a great deal of psychological opinion. Our friend Freud thought women's moral sense was stunted because they stayed attached to their mothers. Another great developmental theorist, Erik Erickson, thought the tasks of development were separation from mother and the family. If women did not succeed in this scale, then they were obviously deficient.

Gilligan's reply was to assert that women were not inferior in their personal or moral development, but that they were different. They developed in a way that focused on connections among people (rather than separation) and with an ethic of care for those people (rather than an ethic of justice). Gilligan lays out in this groundbreaking book this alternative theory.

Gilligan's Stages of the Ethic of Care		
Approximate Age Range	**Stage**	**Goal**
not listed	Preconventional	Goal is individual survival
Transition is from selfishness -- to -- responsibility to others		
not listed	Conventional	Self sacrifice is goodness
Transition is from goodness -- to -- truth that she is a person too		
maybe never	Postconventional	Principle of nonviolence: do not hurt others or self

Thus Gilligan produces her own stage theory of moral development for women. Like Kohlberg's, it has three major divisions: preconventional, conventional, and post conventional. But for Gilligan, the transitions between the stages are fueled by changes in the sense of self rather than in changes in cognitive capability. Remember that Kohlberg's approach is based on Piaget's cognitive developmental model. Gilligan's is based instead on a modified version of Freud's approach to ego development. Thus Gilligan is combining Freud (or at least a Freudian theme) with Kohlberg & Piaget.

In reading Gilligan and understanding her place in psychology, you may yourself come face to face with an intellectual difficulty. The momentous life decision that Gilligan looks at in her central study was that of whether or not to get an abortion. It seems clear from Gilligan's comments in her text that she is a supporter of a women's right to choose. Those of you who agree with her will have less trouble seeing the logic of her system. Those of you who disagree will have to get past the disagreement on this important ethical issue to see if there is anything interesting psychologically in what Gilligan has to say.

Here is the pitch for the psychologically interesting. Gilligan has shown that Kohlberg's (and Freud's, and Erickson's) systems are based on a male-centered view. Kohlberg built his theory based on interviews with males only. She has certainly shown us the inadequacy of that. In addition, she has broken the idea that there is only one dimension of moral reasoning. If there can be two, why not three? Why not several? Finally, she has connected moral decision making back into concerns about both the self and the social environment in which the self lives.

Most psychologists now disagree with the empirical claim that men and women differ in their moral reasoning in the way Gilligan outlines. Several studies have now found both men and women using both justice and care dimensions in their moral reasoning. There have also been criticisms of the rigor of her interview method of research. More careful researchers are now cleaning up behind the trail she blazed.

Ethical theories and principles are the foundations of ethical analysis because they are the viewpoints from which guidance can be obtained along the pathway to a decision. Each theory emphasizes different points such as predicting the outcome and following one's duties to others in order to reach an ethically correct decision. However, in order for an ethical theory to be useful, the theory must be directed towards a common set of goals. Ethical principles are the common goals that each theory tries to achieve in order to be successful. These goals include beneficence, least harm, respect for autonomy and justice.

Ethical Theories and Their Use in Ethics Education

As shown earlier, one helpful way for leading an ethical case study discussion is to give students a guide, such as the “Seven Step Format for Ethical Decision Making” to help them think though the issues presented in a case. Moral theories are another tool to help an individual clearly and logically think about an ethical issue, and arrive at a decision that can be rationally defended. As John Rowan states in his preface to the textbook, Ethics for the Professions

“A moral theory is a mechanism for assessing whether a particular action or rule is ethically justified. More precisely, a moral theory can help us to sharpen our moral vision, it helps us determine whether an action or a rule is ethically right (meaning it is required and must be performed and followed), wrong (meaning it must not be performed or followed), or permissible (meaning it may be, but need not be, performed or followed.”

Moral theories range from Utilitarianism which bases what is considered "morally right" on the consequences of an action, to deontological theories, which base concepts of what is considered "morally right" on universal laws that exist outside of a specific situation. While these approaches differ significantly, all moral theories have two things in common. For a moral theory to be helpful, it should provide us with the source of moral values (reasons why we should be moral), and it should provide us with a framework or strategy for ranking moral norms when we confront a dilemma. (2)

Many instructors of professional ethics are wary of including moral theory in their curriculum, and indeed, it is not necessary to if you are attempting to include only a small amount of professional ethics instruction in your course. Problems often arise when moral theories are presented in unhelpful or confusing ways; either students become overwhelmed when all the details of a theory are presented, or instructors present only the briefest synopsis of a theory that is too sketchy to provide any real benefit for the students. (3) However, moral theories are one way to assist an individual in setting aside the feelings, desires, and ambitions that often tend to skew one's moral vision and look at a problem from a rational viewpoint. Any inclusion of moral theory in should help the student develop a more systemized, rational scheme of thought through which they can reflect on the ethical decisions they will be asked to make, either in the classroom when looking at case studies, or in their chosen professional field. (4) It should not lead to confusion.

Solving Moral Problems

Knowing all this, we may now answer our initial question: How can one solve moral problems? Moral problems are solved by developing moral judgments with regard to an action and choosing the best action. We now know how to develop moral judgments about situations using both Utilitarianism and Kantianism. Using Utilitarianism, the most ethical action would be the action that creates the greatest amount of satisfaction over dissatisfaction. Using Kantianism, the most ethical action would be the action that treats all people as autonomous agents. To solve a moral problem, one must decide which is the most ethical action using approaches such as these. For many people, guidance on solving moral problems comes from a more personal source: their religion. Each religion, be it Christianity, Islam, Judaism, or some other faith, seeks to instill in its followers a set of moral guidelines that can be used to help solve moral problems. It should be noted that both Kantianism and Utilitarianism can be used in conjunction with most religious principles. After all, the main ideas behind both theories have similarities with ideas found in religious texts. When dealing with moral problems, having multiple sources from which to analyze potential solutions can be very beneficial. The process of understanding, developing, and justifying moral judgments can be tedious, especially when a large number of people are involved. For this reason, many organizations have developed ethical codes of conduct that guide people to act ethically in their professions. These ethical codes are based upon philosophical approaches such as the ones that we have just studied. We will now look at the development of these ethical codes of conduct and their usefulness as we examine the second part of the definition of engineering ethics.

Ethical Codes of Conduct

Let us look at the definition of engineering ethics: "Engineering ethics is the development of and compliance with currently accepted engineering ethical codes of conduct." Ethical codes of conduct, or **moral codes**, are simply compilations of ethical actions that act as guides to our lives. For example, the individual ethical actions "Help your neighbor," "Do not kill people," and "Do not steal" may be collected in one moral code to help guide a person to live an ethical life. Each individual ethical action in a moral code could be justified using the Utilitarian or Kantian approach. Moral codes describe the ethical actions that we can base our behavior on through our intuitive use of these approaches. Engineering codes of ethics are based upon general codes of ethics. The engineering codes of ethics are simply compilations of

ethical actions that act as a guide in professional practice. Every moral rule in these codes could be justified using either the Utilitarian or Kantian approach. Every engineering code of ethics leaves room for an engineer to make virtuous choices within his profession while instructing the engineer in the most ethical actions and procedures. It is critical that all engineers comply with the various accepted codes. Although most of the different engineering codes share similar ideals, nearly every major engineering association has its own code that specifically addresses the issues that its members are likely to encounter in the course of their duties. In unit 4, we shall focus different codes of ethics including the National Society of Professional Engineers (NSPE) Code of Ethics.

Engineering Ethics

Students should prepare their own notes by consulting the lecture notes & PPTs.

Unit 3: Safety, Responsibility as an engineer - Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – Road, Rail, Air & Fire safety – Electrical & Industrial Safety

Safety – Responsibility as an Engineer

A civil engineer for instance, has to look at location, load, and environment while structural engineers study the likely damage to gain a better understanding of geological faults and determine why structures fail. Engineers have to show greater concern for child safety for the location of switches, windows, car seats, airbags etc. Ethical engineering involves improving the design of every-day products to make them safer and more efficient. Ergonomists dealing with anything involving people take into account anatomy, physiology, and psychology to make working and life more comfortable. Ergonomic products include specially designed chairs with footrests, glare reduction on computer monitors and gel wrist supports to reduce carpal tunnel syndrome.

Safety and risk

Risk-Benefit Analysis

The ultimate purpose of a Risk -Benefit Analysis is to help determine if a product is worth the risk connected with using it (Martin & Schinzinger, 153). On top of all the assumptions and uncertainties that may go into any analysis, in many cases we cannot even express both sides of this equation in the same terms. In the case of the automobile for example, we might be trying to compare the benefit of personal transport to the loss of life from accidents. What's worse, in some cases the benefits accrue to one group while most of the risk falls on another (e.g. a power plant) . This begs the question: “Under what conditions, if any, is someone in society entitled to impose a risk on someone else on behalf of a supposed benefit to yet others?. In many cases the evaluation is based on such a broad cross section of society that they cannot practically be consulted directly. While Fleddermann says “It is important to be sure that those who are taking the risks are also those who are benefiting” , this is almost impossible to implement in many situations. Perhaps providing adequate information and ensuring an open debate will help all those involved make an informed decision and receive compensation when appropriate.

The fact that sometimes the benefits or risks or both are displaced in time also complicates matters even more. Even with these problems, Risk -Benefit Analysis can still be a very useful tool, especially when used to compare alternative methods of providing the same benefit. For example, in the field of power generation, the benefits are assumed the same for alternative generating methods, and the costs or risks can be compared to determine the preferable option. In doing Risk - Benefit Analysis in situations concerning public safety, it often appears that capital costs are compared to a “dollar value” for a human life (e.g. fatalities on a certain stretch of highway versus the costs to improve that section). As mentioned above, this type of analysis can still be very useful in deciding priorities for spending limited resources. For instance, if reliable statistics were available on the umber of fatalities on different sections of highway along with the costs to improve these sections, one can use this to decide which section to improve first. However, care must be taken to present such analysis in a way that helps the public understand that the intent and the actions are to maximize the saving of lives. If presented poorly, it can look like, for instance, that the “value” of a human life is being assigned some fixed monetary value for engineering economic purposes. While “figures” are invaluable in making planning decisions, they can seem insensitive or

mercenary if treated inappropriately. Too often these types of “figures” are interpreted in a negative light. As partial explanation for their use, and a warning, the U.S. National Highway Traffic Safety Administration noted “We have provided an estimate of some of the quantifiable losses in social welfare resulting from a fatality and can only hope that this estimate is not construed as some type of basis for determining the optimal' (or even worse, the ‘maximum') amount of expenditure to be allocated to saving lives.” Engineers are often called to be part of the public process of examining costs and benefits in order to either improve regulations and standards or in litigation against those who have failed to do so. In all cases, the engineer should be wary of statistics and presentation methods, both in giving and receiving. Remember, meaningful and understandable information is what is required for informed consent. Engineers are usually afforded more respect than an equally versed lay person. This reinforces their responsibility to declare biases or possible conflicts, to present data in a “friendly” and understandable way, and finally to avoid comments in areas outside their expertise

Design Safety

Gone are the days when a design engineer could focus mainly on improving a product’s design functionality. With higher safety levels now both achievable and economical, the engineer’s role in delivering design safety has broadened considerably. At their disposal are a host of new objective analytic techniques to identify hidden hazards and potential problems, determine design countermeasures and remedies, and assess and categorize residual risk. But with these new tools comes a responsibility to manage the consequences of interjecting protective mechanisms and safety devices into a product’s design and operation. Below is a rundown of the benefits, burdens, and opportunities of designing for safety.

Designing for Safety

In a simpler time, safety features and accessories intended to protect equipment operators were considered the responsibility of the user and owner, not the design engineer. But today, more stringent safety standards and rapid technological advances mean engineers can more easily ferret out a product’s potential for failure and then design to prevent it. While these techniques provide management and customers, assurance the products they use will help and not hurt, some design-safety mechanisms can cause problems if not used wisely.

It’s not enough, for example, to simply add a safe-stop mechanism that shuts down just the part of a machine where the problem occurs so that once fixed, operation can quickly resume. That mechanism may require the addition of other safety features—like self-monitoring, redundancy, faults that fail safe—to work properly. Because such systems are commonly used in high-risk situations, they often require special attention.

The impact of a protective mechanism or safety device on other components must be considered to prevent secondary faults or errors, including the possibility that normal operation be resumed prematurely. Maintenance checks of the mechanism also are crucial as over time it may become inactive or unreliable without any warning.

The growing importance of software to mechanical systems is placing other burdens on design engineers. Far too many programs exhibit unexpected bugs, lockups, memory errors, out-of-bounds errors, even excessive test errors or failures. Hence, effective software reviews should begin early enough in the

development and design process so that errors can be fixed, including those difficult-to-find-and-solve design safety problems that often emerge much later.

Extended field-testing, not just bench testing, is needed to head off design safety problems before the customer has to experience them.

Backup Warnings

Safety warnings can be an effective supplement to engineering safety design. A warning can't prevent harm, however, unless clearly conveyed and tailored for the right stakeholder. Whereas warnings for users are designed to identify hazards and risks to help them avoid personal harm, the information provided to customers is meant to give them what they need to know to weigh any associated risks before they buy the product. Getting the wording just right is crucial as warnings that raise too many alarms can trigger information overload that may undercut the original intent.

Safety around the World

In order to tap into international markets, businesses must broaden the design process to take into account the global regulatory landscape as well as the forces driving overseas consumer-products markets.

For their part, engineers must stay abreast of safety requirements abroad to determine the design and manufacturing impact on their work. For example, the European Union's RoHS (Restriction of Hazardous Substances) directive restricting lead-based alloys used for solder and plating requires U.S. and other non-EU manufacturers to engineer around new issues of connector reliability and performance, which could change the manufacturing process and create new avenues of failure to explore.

Many nations and international organizations such as the United Nations also are spearheading regulatory changes designed to eliminate barriers to trade. For example, the European Union's REACH (Regulation, Evaluation, Authorization, and Restriction of Chemical Substances) program is helping to bring about a global system for the classification, labeling, and packaging of chemicals and products that contain them to enable shipment of uniform products anywhere in the world.

The design-safety implications of this and other related programs have some engineers wondering whether it's time to begin proactively designing products and systems with worldwide safety trends in mind.

End of Service Life Issues

Engineers who do their jobs too well (i.e., design products that last and last), must face other complex issues. How should end-of-life disposal and recycling be approached for products with long service life when new product safety requirements can be passed into law at any future time? What kind of exculpatory documentation should be retained regarding safety analyses performed when they could potentially incriminate those involved with design and development at some future point? Where operational teamwork is required on a system, how can studies of operator interactions be performed to reveal design data without infringing on privacy or creating an appearance of bias?

Safety Requirements in software intensive industry

Rather than safety requirements, many industry and governmental standards and regulations typically concentrate on the specification of safety constraints. As defined in the following hierarchical list, safety constraints are clearly another way of specifying safety-related requirements: A requirement is any mandatory, externally observable, verifiable (e.g., testable) behavior, datum, characteristic, or interface.

A constraint is any engineering decision (e.g., architectural mechanism, design decision, implementation technique) that has been selected to be imposed as a requirement.

A safety constraint is any constraint that specifies a specific safeguard (e.g., architectural safety mechanism, safety design feature, safety implementation technique).

Safety constraints typically include things like requiring interlocks and physical barriers around moving parts, safeguards concerning electricity and the handling of toxic chemicals, and the mandatory placement of warning signs. A potential danger in the mandating of specific safeguards is that it may well be possible to architect a better system in which the associated hazards cannot occur and thus the mandated safeguards become unnecessary or inappropriate. In fact, the new system without the safeguards may be both cheaper and safer. For example, using magnets to keep refrigerator doors closed eliminated the need for installing safeguards to allow trapped children to open the previous locks from the inside.

Safety-Critical Requirements

The most common approach to dealing with safety during requirements engineering is to concentrate on the identification of safety-critical requirements. Unlike safety requirements which are a type of quality requirement, safety-critical requirements are typically functional, data, or interface requirements that must be properly implemented if hazards and their associated accidents are to be avoided or minimized. The completeness of safety-critical requirements (a potential source of accidents) can be addressed by considering all events in all modes (i.e., performing state and event completeness analysis) as well as performing I/O variable completeness analysis (e.g., all sensor input) . Many accidents are caused by problems with system and software requirements, and “empirical evidence seems to validate the commonly stated hypothesis that the majority of safety problems arise from software requirements and not coding errors”. Major accidents often result from rare hazards, whereby a hazard is a combination of conditions that increases the likelihood of accidents causing harm to valuable assets (e.g., people, property, and/or the environment). Most requirements specifications are incomplete in that they do not specify requirements to eliminate these rare hazards or mitigate their consequences. Requirements specifications are also typically incomplete in that they do not specify what needs to happen in exceptional “rainy day” situations or as a response to each possible event in each possible system state although accidents are often caused by the incorrect handling of rare combinations of events and states that were considered to be either impossible or too unlikely to worry about, and were therefore never specified. Even when requirements have been specified for such rare combinations of events and conditions, they may well be ambiguous (an unfortunately common characteristic of requirements in practice), partially incomplete (missing assumptions obvious only to subject matter experts), or incorrect, or inconsistently implemented. Thus, the associated hazards are not eliminated or the resulting harm is not properly mitigated when the associated accidents occur. Ultimately, safety related requirements are important requirements that need to be better engineered. Consider for example an automatic subway system connecting terminals within an airport. There will be functional software requirements for starting and stopping the subway train, for accelerating and decelerating the trains between terminals, and for opening and closing the subway car doors. These requirements may be analyzed using use cases or using state transition diagrams. Clearly, while it is important to be able to travel between terminals and important to open the subway car doors at stops, it is also important to not open the doors when the subway is moving

because people and their luggage can fall out, resulting in injury, death, and property damage. Similarly, accelerating or decelerating too fast can also cause people to fall and be injured. Thus, the software controlling subway train starting, stopping, accelerating, and decelerating as well as the software controlling the opening and closing of the doors is safety critical. Thus, the associated functional requirements are safety-critical, whereas the functional requirements concerning the announcement of arrival at a terminal are not safety critical. Actually, identifying functional, data, and interface requirements as either safety-critical and non-safety-critical is probably too gross of a categorization. When using hazard analysis to categorize safety risks into safety assessment levels (a.k.a., safety integrity levels), one often obtains a larger number of safety risk categories such as: very high risk, high risk, medium risk, low risk, and no risk. Requirements having no safety risks can be viewed as non-safety-critical, but requirements having higher categories of safety risks should probably not be grouped together and categorized as safety-critical. Instead, such requirements should be categorized by safety risk level, possibly as follows: very high risk safety can be referred to as safety-critical requirements, high risk safety requirements can be referred to as safety-important, medium risk requirements can be referred to as safety significant, and low risk requirements can be referred to as safety-relevant. This allows different safety evidence assurance levels for the requirements. For example, functional, data, and interface requirements that are safety-critical may need to be specified using a formal specification language, whereas the lower levels may need successively less evidence to support safety certifications

An **industrial safety system** is a countermeasure crucial in any hazardous plants such as oil and gas plants and nuclear plants. They are used to protect human, plant, and environment in case the process goes beyond the control margins. As the name suggests, these systems are not intended for controlling the process itself but rather protection. Process control is performed by means of process control systems (PCS) and is interlocked by the safety systems so that immediate actions are taken should the process control systems fail.

Process control and safety systems are usually merged under one system, called *Integrated Control and Safety System* (ICSS). Industrial safety systems typically use dedicated systems that are SIL 2 certified at minimum; whereas control systems can start with SIL 1. SIL applies to both hardware and software requirements such as cards, processors redundancy and voting functions.

Industrial Safety Integration provides both training services and software solutions to meet the ever-increasing requirement to assess industrial safety. Industrial machinery risk analysis and risk reduction techniques can create a very complex matrix of solutions. Industrial Safety Integration can help your company make informed decisions that will help to keep your employees safe. In India the construction industry is the second largest employer next to agriculture whereas it is next to none in the road accidents . The annual turnover of the construction industry in India is about 4000 Billion Rupees, which is more than 6% of the National GDP employing a large work force. The construction works in NPCIL, are enormous. The number of fatalities occurring from construction work in the industry is quite disturbing and fall of person from height and through openings are the major causes for serious accidents.
For the last several years, NPCIL has been executing massive construction activity. During the past seven years, NPCIL has taken up construction of 8 reactors at 4 locations namely Tarapur, Kaiga, Rajasthan and Kudankulam. A faster pace of project execution with parallel construction activities in civil, electrical, mechanical and other jobs for reducing the gestation period through mega package contract employing morethan 25,000 construction workers have been very successful. The mobile natureof work force poses challenge in ensuring that all of them are adequately trained. After the completion of 2 units of

Tarapurand one unit at Kaiga, at present the workforce at construction sites is about 12,000. While successfully completing projects under construction, NPCIL gained valuable experience in meeting several challenges in Industrial Safety management. Construction safety management indeed is a challenging task due to the dynamic nature of construction activity coupled with involvement of unskilled, illiterate and mobile work force. Since the projects are located in remote regions of the country the surrounding population involved in construction activities is substantial. These personnel are generally from an agricultural background, speaking and understanding local languages only. This poses additional challenge due to limitation in communication. Construction hazards are rated as eight times more risky than those from manufacturing sector. NPCIL, proactively, has been conceiving, developing and implementing unique safety programs and mechanism to overcome this. The implementation of feedback mechanisms and developing wider appreciation of safety among executing agencies on a continual basis, since the inception of nuclear power programme, has indeed paid rich dividends in achieving higher appreciation of Industrial Safety requirements and effective implementation of the same in NPCIL. . With strong planning, effective implementation and continual training with focussed safety management a good safety record could be achieved comparable to international level. The average Fatal Accident Frequency Rate (FAFR) in NPCIL during last five years is 0.22 incidents / 1000 employees /year as against an estimated value of 15.8 for Indian Construction Industries. In this context, it is worthwhile to mention that FAFR for construction industry in the US as per data published US Dept. of Labor for the year 2005 is 0.23. However, we are not complacent and efforts to achieve the next level of excellence are being invested on a structured manner. Therefore we need to focus on the following aspects,

- Innovation in the training methodologies to achieve higher effectiveness of training among the contractor employees.
- Developing and implementing Behaviour Based Safety Program to improve orientation of work force towards safety in work.
- Implementation of innovative engineering measures to strengthen the safety requirements at design stages to achieve safe working environment during construction.
- Training and certification, in Industrial Safety requirement, of line managers and others responsible for construction activity essentially to enhance their perception and appreciation for industrial safety. The role of line managers and safety professionals in preventing the safety-related incidences is quite important. Therefore, it is necessary that safety requirements are assured on regular basis by scrupulous field rounds and the deficiencies identified are attended to promptly. Further, the attributes and requirements to achieve effective management of safety right from the design stage to execution and operation must be identified and addressed appropriately through a structured program. To achieve this prime objective, it is imperative to recognize the important elements of the safety management system and strengthen the same at each stage.

In order to enhance the safety standards and safety culture it is imperative that the existing programs and processes in safety implementation is to be pursued religiously. Additionally, the following need to be taken up as a consolidated program.

1. Evolving and implementing engineering solutions such as safe access to work locations and mechanization
2. Industrial Safety clauses in contract conditions which are formulated need to be pursued for effective implementation.
3. Field surveillance through a structured checklist and prompt addressal of deficiencies.
4. Ensuring administrative control of construction activities through institution of work permits, height pass and other work procedures.
5. Encouraging the mock exercises by performing model and mock up for complex works.

6. Certification of line managers in Industrial safety.
7. Development of a pool of line managers having Industrial Safety diploma as a long term measure bring in still greater appreciation and regard for industrial safety.

Fire safety refers to precautions that are taken to prevent or reduce the likelihood of a fire that may result in death, injury, or property damage, alert those in a structure to the presence of an uncontrolled fire in the event one occurs, better enable those threatened by a fire to survive in and evacuate from affected areas, or to reduce the damage caused by a fire. Fire safety measures include those that are planned during the construction of a building or implemented in structures that are already standing, and those that are taught to occupants of the building. Threats to fire safety are referred to as *fire hazards*. A fire hazard may include a situation that increases the likelihood a fire may start or may impede escape in the event a fire occurs.

Fire safety is often a component of building safety. Those who inspect buildings for violations of the Fire Code and go into schools to educate children on Fire Safety topics are fire department members known as *fire prevention officers*. The Chief Fire Prevention Officer or Chief of Fire Prevention will normally train newcomers to the Fire Prevention Division and may also conduct inspections or make presentations. Key elements of a fire safety policy

- Building a facility in accordance with the version of the local building code
- Maintaining a facility and conducting yourself in accordance with the provisions of the fire code. This is based on the occupants and operators of the building being aware of the applicable regulations and advice.

Examples of these include:

- Not exceeding the maximum occupancy within any part of the building.
- Maintaining proper fire exits and proper exit signage (e.g., exit signs pointing to them that can function in a power failure)
- Compliance with electrical codes to prevent overheating and ignition from electrical faults or problems such as poor wire insulation or overloading wiring, conductors, or other fixtures with more electric current than they are rated for.
- Placing and maintaining the correct type of fire extinguishers in easily accessible places.
- Properly storing and using, hazardous materials that may be needed inside the building for storage or operational requirements (such as solvents in spray booths).
- Prohibiting flammable materials in certain areas of the facility.
- Periodically inspecting buildings for violations, issuing Orders To Comply and, potentially, prosecuting or closing buildings that are not in compliance, until the deficiencies are corrected or condemning it in extreme cases.
- Maintaining fire alarm systems for detection and warning of fire.
- Obtaining and maintaining a complete inventory of firestops.
- Ensuring that spray fireproofing remains undamaged.
- Maintaining a high level of training and awareness of occupants and users of the building to avoid obvious mistakes, such as the propping open of fire doors.
- Conduct fire drills at regular intervals throughout the year.

Fire code

In America, the **Fire code** (also **Fire prevention code** or **Fire safety code**) is a model code adopted by the state or local jurisdiction and enforced by fire prevention officers within municipal fire departments. It is a set of rules prescribing minimum requirements to prevent fire and explosion hazards arising from storage, handling, or use of dangerous materials, or from other specific hazardous conditions. It complements the building code. The fire code is aimed primarily at preventing fires, ensuring that necessary training and equipment will be on hand, and that the original design basis of the building, including the basic plan set out by the architect, is not compromised. The fire code also addresses inspection and maintenance requirements of various fire protection equipment in order to maintain optimal active fire protection and passive fire protection measures.

A typical fire safety code includes administrative sections about the rule-making and enforcement process, and substantive sections dealing with fire suppression equipment, particular hazards such as containers and transportation for combustible materials, and specific rules for hazardous occupancies, industrial processes, and exhibitions.

Sections may establish the requirements for obtaining permits and specific precautions required to remain in compliance with a permit. For example, a fireworks exhibition may require an application to be filed by a licensed pyrotechnician, providing the information necessary for the issuing authority to determine whether safety requirements can be met. Once a permit is issued, the same authority (or another delegated authority) may inspect the site and monitor safety during the exhibition, with the power to halt operations, when unapproved practices are seen or when unforeseen hazards arise.

List of some typical fire and explosion issues in a fire code

- fireworks, explosives, mortars and cannons, model rockets (licenses for manufacture, storage, transportation, sale, use)
- certification for servicing, placement, and inspecting fire extinguishing equipment
- general storage and handling of flammable liquids, solids, gases (tanks, personnel training, markings, equipment)
- limitations on locations and quantities of flammables (e.g., 10 liters of gasoline inside a residential dwelling)
- specific uses and specific flammables (e.g., dry cleaning, gasoline distribution, explosive dusts, pesticides, space heaters, plastics manufacturing)
- permits and limitations in various building occupancies (assembly hall, hospital, school, theater, elderly care, child care, prs that require a smoke detector, sprinkler system, fire extinguisher, or other specific equipment or procedures
- removal of interior and exterior obstructions to emergency exits or firefighters and removal of hazardous materials
- permits and limitations in special outdoor applications (tents, asphalt kettles, bonfires, etc.)
- other hazards (flammable decorations, welding, smoking, bulk matches, tire yards)
- Electrical safety codes such as the National Electrical Code (by the National Fire Protection Association) for the U.S. and some other places in the Americas
- Fuel gas code

Rail safety

"We require a safe, secure, efficient, reliable and integrated national transport system that supports and enhances our nation's economic development and social
and environmental well-being." To achieve this vision, we commit to the following policy objectives:

- Economic: To promote the efficient movement of people and goods in order to support sustainable economic development and prosperity.
- Safety: To provide a safe transport system that meets Australia's mobility, social and economic objectives with maximum safety for its users.
- Social: To promote social inclusion by connecting remote and disadvantaged communities and increasing accessibility to the transport network for all Australians.
- Environmental: Protect our environment and improve health by building and investing in transport systems that minimize emissions and consumption of resources and energy.
- Integration: Promote effective and efficient integration and linkage of Country's transport system with urban and regional planning at every level of government and with international transport systems.
- Transparency: Transparency in funding and charging to provide equitable access to the transport system, through clearly identified means where full cost recovery is not applied.

Following on from these objectives, we sould consider the options of establishing national frameworks for regulation for heavy vehicles, marine safety and rail to move towards establishing genuine national markets and a seamless regulatory framework.

The current rail safety regulatory framework of Australia
"The most compelling reasons for the Commonwealth, state and territory governments to commit to national consistency in regulations are: the contribution that consistency can make to the effectiveness of the regulations; the efficiency of their administration and enforcement; and to the efficiency of the economy as a whole."
Australia's rail safety regulatory framework comprises:

- The safety outcomes desired and the policies to achieve these outcomes
- The 'rules' by which participants abide
- The standards to which participants adhere
- The institution or institutions that administer the rules
- The quality and quantity resources (staff and financial) made available by governments to undertake the regulatory task.

The safety outcomes desired by governments are succinctly articulated in the Victorian Department of Transport's submission as "to reduce risk to life and limb at affordable costs." To date, governments have best articulated their outcomes in the national model rail safety legislation. The objectives of the model rail safety Bill place a high value on the effective management and control of risk to improve safety in railway operations and to promote public confidence in the safety of rail transport.
Industry is in the process of preparing a national rail safety strategy, which should articulate industry's desired outcomes. This regulatory impact statement is primarily concerned with the unanswered questions of institutional arrangements. Of the components of the regulatory framework set out above, standards are industry responsibilities and governments have addressed the rules (legislation) extensively in recent years, although there is still room for improvement. Some work on institutional arrangements had been undertaken by the NTC, but was not concluded prior to commencing this regulatory impact statement. Institutional arrangements in rail safety regulation have been examined before. In 1999 ATC engaged consultant Booz Allen Hamilton to review the 1996 intergovernmental agreement. The review

recommended, amongst other matters, the introduction of a single national regulator. The recommendation was not endorsed by ATC at the time. The 2006 Productivity Commission inquiry into road and rail freight infrastructure pricing found,
"There are efficiency gains to be obtained from a single institutional framework for safety regulation of rail. The adoption of nationally consistent rail safety regulation legislation by July 2007 is, therefore, a priority. Gains from harmonization would be compromised if jurisdictions legislate based on differing interpretations of the nationally agreed draft bill.

Electrical Safety

Electricity is a powerful source of energy that powers lights, tools, machinery and many other devices necessary for our day-to-day work. Electricity can also be a hazard causing injury or death. Experts in the electrical industry look to the National Electric Code (NEC) for the electrical safety standards on how to correctly assemble and maintain electrical circuits and the National Electric Safety Code (NESC) for the basic provisions for safeguarding persons from hazards when installing, operating or maintaining electric currents.

OSHA (Occupational Safety & Health Administration) recognized the importance of the NEC and included the 1971 edition into Subpart K of the 29 CFR 1926 for the construction industry. They have since made updates, revised and clarified the standard to make it more flexible in order to eliminate the need for the constant revision to keep pace with the NEC, which is updated every 3 years. For the general industry, OSHA has dedicated 29 CFR 1910 Subpart S to electrical safety. On February 14, 2007, OSHA published a final rule revising the electrical installation standards found in Subpart S that are intended to reduce the risk of injury and death caused by unsafe electrical installations. This revised standard became effective on August 13, 2007.

Some of the requirements of sections 29 CFR 1910.303 through 1910.308 do not apply to all electrical installations. It can be difficult to determine which requirements apply to the installation based on the time period in which the equipment was built or last modified. To remedy this problem OSHA has developed an interactive eTool designed to assist employers determining what regulation applies to them based on the date of installation or modification of the equipment.

Electricity and Its Effects on the Body

In order for electricity to work, a complete circuit made of a conductor, a load or electricity-consuming device and a ground is needed. Electricity will flow through the conductor to the load and finally to the ground to complete the circuit. Electricity will follow the path of least resistance to ground—similar to water in a pipeline that flows out of a valve when it is opened. Electricity becomes dangerous when you become part of the circuit, because the closest path to ground may be through you, causing an electrical shock.

When you are shocked by electricity, your muscles contract. If the lungs are involved in the path of the circuit, voluntary respiration can be halted. If the heart is involved, fibrillation can occur resulting in heart failure. As little as 50 milliamperes can cause death. It is important to realize that an electrical shock may not be strong enough to cause a fatality but it could cause you to fall or jolt to dangerous surroundings. For details on the effects electricity has on the body, see table 1.

Qualified Personnel vs. Unqualified Personnel

The 29 CFR 1910 Subpart S identifies two types of people that may come in to contact with electrical equipment on a jobsite: qualified and unqualified. A qualified person is one who has been trained to avoid electrical hazards when working on or near exposed energized parts and is:

- Familiar with the safety-related work practices required in 29 CFR 1910.331-1910.335
- Able to distinguish exposed live parts of electrical equipment
- Knowledgeable of the skills and techniques used to determine the nominal voltages of exposed parts

An unqualified person is someone who has little or no training regarding electrical hazards. Even though unqualified persons may not be exposed to energized parts, training should still be provided so they can be familiar with any necessary electrical safety practice.

Electrical Safety Practices at Work

Safe work practices are used to prevent electrical shock or similar injuries by keeping workers away from energized equipment or circuits and by training qualified workers on the correct procedures when working on energized equipment or circuits. Prior to using or performing maintenance on electrical equipment, the employee should first determine if it is safe by checking the following:

- Make sure the electrical equipment is not located in a hazardous environment, such as a damp/wet location or where it is exposed to high temperatures and flammable liquids and gases
- Make sure current and safety devices, such as fuses, breakers and ground fault circuit interrupters, have not been tampered with and are working correctly
- Make sure the power cord and plug do not have any defects, such as cuts in the insulation exposing bare wiring
- Know if the equipment has an emergency shutoff switch and where it is located prior to use
- Make sure there is sufficient space around the electrical equipment or circuit in order to maintain or operate
- Make sure all personal metal jewelry is removed prior to using or working on electrical equipment or circuits
- De-energize electrical equipment before testing or repairing in accordance with the Lockout Tagout standard 29 CFR 1910.147.

If de-energizing the electrical equipment or circuit will increase the potential for an electrical hazard or is necessary for testing and troubleshooting, the appropriate tools and personal protective equipment (PPE) must be used and worn for the specific parts of the body to be protected.

Insulated Tools

Insulated tools must be used when working on or near exposed energized live conductors. Only insulated tools that comply with the International Electrotechnical Commission standard 900 (IEC 900) and marked with the international 1000V rating symbol should be used. Not all tools with a plastic coating or plastic handles provide protection from electrical shock. It is important to inspect your tools before performing electrical work—not only to verify if the tools are rated for the job, but also to check for damage, wear and

if they no longer provide adequate protection from electrical shock. Damaged or worn tools should be removed from service immediately.

Electrical Protective Equipment

Electrical protective equipment, also known as insulating equipment, includes items such as insulated blankets, matting, covers, line hose, gloves, sleeves, face shields and arc flash clothing. Blankets, gloves and sleeves are clearly marked with class and type, while clothing is labeled with an arc thermal performance value rating (ATPV) measured in calories per square centimeter (i.e. 65 cal/cm). The class refers to the maximum-use voltage. Insulating must not exceed maximum-use voltages .The type refers to ozone resistance. Type I is not ozone resistant. Type II is ozone resistant. The ATPV rating cal/cm identifies the amount of energy that can be delivered to a point at a particular distance from an arc flash. The higher the number, the more protection the clothing offers.

Insulated equipment should be inspected prior to each day's use and immediately following an incident that may have caused damage. Damage consists of holes, tears, cuts, punctures, ozone cutting, embedded foreign objects, swelling, softening, hardening or any other defect. Once an insulated piece of equipment is removed from service, it may not be reused until it has been retested and certified. All electrically insulated equipment must also be retested and certified periodically.

Employee Training

Electrical safety is the responsibility of everyone on the jobsite. It is important to establish a hazard assessment program that includes employee training on electrical safety. Training employees on the basics of electrical safety should include its effects on the body, first aid procedures when someone is shocked, how to fight an electrical fire and how to identify hazards. Some do's and dont's that can assist in electrical safety training include:

DO'S

- Read and follow electrical equipment instruction manuals prior to using
- Use safety signs, barricades and tags to identify and protect electrical equipment
- Only use extension cords as a last resort
- Use waterproof cords in an outdoor application
- Contact a certified electrician when electrical repair is needed

DONT'S

- Overload outlets by using splitters
- Touch electrical equipment, including power cords with wet or damp hands
- Allow dirt, grease or dust to accumulate on electrical equipment
- Use temporary wiring in place of permanent wiring
- Use cords or equipment that are not properly grounded

SPUSA Pledge

Through the SPUSA pledge program young people are challenged to make a personal commitment to use science and technology in a socially responsible way, thereby, contributing to a safer, more just society.

The pledge creates public discourse over the role of individual responsibility when selecting a career.

The pledge reads:

> *I promise to work for a better world, where science and technology are used in socially responsible ways. I will not use my education for any purpose intended to harm human beings or the environment. Throughout my career, I will consider the ethical implications of my work before I take action. While the demands placed upon me may be great, I sign this declaration because I recognize that individual responsibility is the first step on the path to peace.*

Univ of Leeds

Transmission Towers

George Randall is a civil engineer with over 10 years' experience in analysing transmission towers (pylons & communication towers) and poles that support wire. He is working for Elexis, an electricity company, on a project to install PCS antennae on existing pylons. This will involve extra weight being added to the towers and George is to calculate the stresses involved to work out where this weight is best placed in order to protect the integrity of the tower.

George has at his disposal software that can accurately model the behaviour of the towers and allow him to see how the tower would behave with the antennae in various positions and with the value of other variables changing. Using this programme George ascertains the optimum position for the antennae. Having done this he then uses the software to test how the tower will react under certain conditions with the new antennae in place.

George is working with lattice towers that are rectangular based and these have a problem with the narrow face not having sufficient leg spacing to resist a wind load on the wide face. There is a critical angle that produces maximum leg compression. In the 'old days' skewed wind angles would not be included in George's calculations: without software it took days to calculate one normal load case and do an analysis by hand; to consider skewed wind angles too was far too calculation-intensive. However, with software giving George the ability to study the phenomenon in detail, he feels that it is prudent to examine all wind angles and build for the worst case scenario.

The software indicates that under a certain wind speed and direction, the tower will fail: if the wind hits the wires at a skewed angle with a high enough speed, this will cause the legs of the tower to buckle. However, George calculates that guying the tower will help to brace it and reduce the leg loads to acceptable levels. George reports the results of his analysis to his boss, Fiona Linley, who is an electrical engineer. He outlines how, in his opinion, the tower will fail if the wind hits maximum design speed at the most critical direction but explains that guying it will counteract this effect.

Fiona says that George is to continue with the installation of the antennae in the position he recommends, and to ignore the oblique wind direction. A few years ago this would never have been taken into account anyway, plus the safety record of towers of this kind is excellent. She has had to come to a management decision about the issue of risk versus reward: the high winds are unlikely in her opinion and the guying is expensive to implement given that the chance of such a wind occurring is so low.

George does not know what to do. He knows that there has been no incidence of tower failure under high winds in his working lifetime. However, PCS antennae have only been introduced in the last 5 years, and there have been no high winds during this time to test whether towers are safe at high wind speeds.

Moreover, it is George that will have to approve the plans as the civil engineer, not his boss and he feels that he will be responsible for any failure. Fiona is also due to retire in the next 2 years and so even if the tower does fail in its 50 year lifespan, she is not going to be around to take the blame for it. George, however, has a lot of his career still ahead of him.

George looks at the building regulations to see if they can give him answers about what he should do: if the regulations say that towers must be designed with oblique wind angles in mind then his dilemma is solved. However, while the regulations mention that "under extreme wind conditions, an oblique wind may require greater structural strength" than normal, this is only a suggestion or recommendation; the regulations do not state that reinforcing structures to account for oblique winds is a legal *requirement*. George considers approaching Fiona's boss, Tim Jackson, but having a background in business rather than engineering, he might not understand the complexities of the issue.

Questions

Imagine that you are George and you are genuinely concerned about the safety of the towers. You have to come to a decision about whether to do as Fiona says or not.

(i) What do you do first? What further lines of inquiry would you pursue to help you with your decision?

(ii) What decision do you make? Give three reasons why you think that this is the best course of action. Could you defend this decision ethically?

(iii) Does it make a difference to your decision that Elexis are affixing the new antennae purely for commercial benefits?

(iv) Would it make a difference to your decision if you knew that some of the antennae will be erected near residential areas?

(v) Who would be responsible if any of the towers failed?

Changes on the industrial scene

Changes in patterns of employment

The regulatory environment now has to cope with the increasing trend in industry and elsewhere to outsource work and hence risks, with changes in patterns of employment and with the fragmentation of large companies into autonomous organisations working closely together. For example, there have been dramatic increases in self-employment and home-working; small and medium size firms are now a major force in creating jobs.
Moreover, many monolithic organisations have become a series of separate companies, eg the railways now operate as separate companies with different responsibilities for operating the track, the rolling stock and the networks.

Polarization of approaches between large and small firms

Some of these changes have blurred legal responsibilities for occupational health and safety, traditionally placed on those who create the risks or on those best situated to take steps to control the risks. In certain industries it is often no longer easy to determine who may be in such a position. Though case law has in many instances clarified the situation, the fact remains that for many sectors the above factors make it more difficult to coordinate the adoption of measures for controlling risks. Many more players are involved, some with little access to expertise. There has in consequence been a growing demand by small firms for a reversion to prescriptive regulation, running counter to the self-regulatory approach – a

demand resisted by large firms because they do not face the same problems and are comfortable with the self-regulatory approach. This has resulted in greater emphasis being placed on the need for clarity of the status and content of the guidance element of the architecture of regulation.

A growing perception that risks imposed on people should be justified

There is a growing propensity to scrutinise benefits brought about by industrial activity against potential undesirable side effects such as the risk of being maimed or killed or of environmental pollution. This is particularly true for risks: _ which could lead to catastrophic consequences; _ where the consequences may be irreversible, eg the release of genetically modified organisms; _ which lead to inequalities because they affect some people more than others, such as those arising from the siting of a chemical plant or a waste disposal facility; _ which could pose a threat to future generations, such as toxic waste.

This has already resulted in industry having less discretion on matters on which they previously had considerable freedom to decide which course of action to adopt, eg plans for modifying their plant within their own boundaries, what raw materials and processes they should use, or how the waste generated (or the plant itself at the end of its useful life) should be disposed of.

Noise at Work

Nick Rafferty works for Wallcote Brothers, a small engineering firm that produces components for washing machines and other domestic appliances. Nick has been with the company 5 years and after completing his induction programme (6 week rotations in each of the company's departments) settles in their design division. He is a popular member of staff and combines a very sharp mind and an ability to solve problems with a relaxed and easygoing manner, which makes him popular with employees from all levels of the firm. This includes the 'shop floor team', with whom he occasionally shares an after-work pint.

Nick has recently been promoted to Team Leader of Design. Whilst he still reports to Henry Jarvis the Head of Design, Nick has the responsibility for managing a group of 20 employees comprising part of the shop floor team that manufactures washing machine drums. Nick's promotion initially made things a bit frosty with some his new team members as he changed from being their friend to being their supervisor at work. However, Nick has a natural management style which soon appeases any worries that any of the team had about the power going to his head.

Nick is called into Henry's office one day where Henry explains that all shop floor employees at Wallcote Brothers must undergo their regular audiometric surveillance. Most of Wallcote's employees work on a noisy factory floor. Health and Safety laws require that, among other things, companies must implement health surveillance programmes as a duty of care where their employees are exposed to health risks such as loud noise on a prolonged or regular basis.

EarsRUs, a private occupational health service, has been brought in to deliver the surveillance and Nick must inform his team that they are expected to undergo a hearing test. Nick announces in the team briefing the next morning that EarsRUs will be visiting the following week. He explains that the employees' hearing only will be monitored, and that the purpose of this is to ascertain whether Wallcote needs to take any further measures to protect its employees' health.

EarsRUs come in to the factory and conduct the tests. After these are complete they report their findings to Wallcote's Human Resources (HR) department. EarRUs are not at liberty to disclose confidential clinical information about the health of particular individuals which they gain as a result of administering the tests but they do update each employee's health record, stating whether they are fit or unfit for work. All of Nick's team are declared as fit for work. Although patient confidentiality means that Wallcote cannot access any particular employee's test results without that employee's written permission, they are entitled

to see grouped anonymized results. This data identifies how many employees' hearing abilities fall within a particular range. Wallcote request such information after every health surveillance check, and do so on this occasion as a matter of routine.

On receipt of the information, the HR department compare this year's results to those from previous years. There is a small staff turnover at Wallcote, with around 85% of the workforce having 6 or more years of service. It is noticed that there is a significant proportion of staff whose hearing has deteriorated over the years, which indicates that there is a worrying trend developing. While all employees were declared fit for work, if the hearing loss trend continues, this may result in more serious long-term problems arising.

Teaching strategy

The tutor takes a facilitator role directing questions where necessary to generate discussion, allowing students to voice their own opinions and encouraging students to justify their answers. To begin the class, give each student part 1 of the scenario and give them time to **read the text**. **(5 minutes or less for this section)**

Next **split the students into groups** of 4-6 and get them to discuss the question. (These are ideal numbers but larger groups are workable. There should really be no more than five groups in a class and larger group sizes are preferable to greater numbers of groups so expand group sizes if necessary). Encourage students to move chairs or themselves around where possible so that group members can hear each other and so that the different groups are sufficiently distinct from one another. It is often useful to split up groups of friends and put students with people with whom they would not normally converse. While this might make the students awkward to begin with, it helps them to focus on the task and usually ensures that a broad range of opinions are represented within each group making the discussion livelier and more involved. **(10-15 minutes)**

After there has been some discussion bring the group together for a **group discussion**. Ask a member of each group to briefly summarise their answer to the question. The class discussion can begin by focusing on a point at which groups disagreed and ask them to comment further - why they gave that answer, why they think that the other groups are wrong etc. Discussion should flow but below are the main points that should be covered **(10-15 minutes)**:

What should Nick do? Nick really only has two options; either he can say nothing or he can come clean

- **Say nothing:** Because of the anonymised data, Nick cannot be certain that any of his team have damaged hearing. Admitting to Henry that he does not enforce the wearing of safety equipment can only harm Nick's reputation at work. He could start getting his team to wear their protection from now on and this would comply with the law and protect his team members from any further damage. Moreover, the members of his team also have a responsibility to wear their hearing protection. Nick has failed to enforce the use of earmuffs but the situation is not entirely his responsibility. Henry, however, may not see it this way so silence may be the best way to protect himself. However, Wallcote may be about to spend money on unnecessary safety equipment. The SMT will assume that safety equipment is currently being used and that the deterioration in employees' hearing indicates that more elaborate and expensive equipment is required.
- **Come clean:** As a supervisor Nick is in a position of responsibility and expected by Wallcote to behave professionally. This will entail being honest about how things are going on the shop floor, including at those times when honesty means Nick admitting some faults on his part. Because the company needs to plan its safety policy, Nick should inform them that employees rarely use their hearing

protection. This information will allow the SMT to implement safety measures which are appropriate for the risks present and will have the effect of protecting the health of the employees more effectively in the long run. By doing this Nick will also demonstrate to Henry that he is honest. This will foster an atmosphere of trust and openness between them which will help their working relationship with benefit to Wallcote and possibly to Nick's future career prospects.

There is a strong ethical case for Nick coming clean but you could discuss how doing the right thing is often difficult - it may involve putting one's own interests below those of others, for example. In this case, Nick runs the risk of being disciplined for not implementing safety policies properly but this risk may be outweighed.

Engineering Ethics

UNIT – IV:

Engineering ethics-global issues and laws, sources - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights – Plagiarism - Intellectual Property Rights (IPR) – discrimination- Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, IEI, IIMM, IETE etc.

Global Issues

'We want freedom and privacy, but also the benefits of technologies that threaten freedom and privacy'.

'A well intentioned engineer may still be a "bad" engineer if his work does not serve the public well'.

"All products of technology present some potential dangers and thus engineering is an potential dangers, and thus engineering is an inherently risky activity. Engineering should be viewed as an experimental process. It is not, of course, an experiment conducted solely in a laboratory under controlled conditions. Rather, it is an experiment on a social scale involving human subjects"

"Good people do not need laws to tell them to act responsibly while bad people will find a around the laws" –Plato

"Always do the right thing this will gratify some and astonish the rest"- Mark Twain

"A long habit of not thinking a thing wrong gives it a superficial appearance of being right"-Thomas Paine

"Sweat saves blood. Blood saves lives and brains save both"-Gen George Patton

"In so many aspects of life, you need to be a long-time optimist, but a short time realist. You need to know what you know and what you do not know…, We need to try to do the right thing every time because we never know what time in our life we will be judged on.." Capt. Chesley Sullenburger

International Operation & Global Issues

An engineer's life is being influenced more and more by the global marketplace in which we practice. As more and more companies expand their operations to include international work, the engineer's professional life is bombarded with new considerations regarding the physical, cultural and political environments with which they must deal. International trade agreements and the move towards international laws governing human rights and environmental issues complicate many of the decisions one must make in both personal and professional life. Such considerations raise new moral and ethical questions that are relevant to engineers and thus deserve examination.

The interest in international pursuits seems well justified. For the company, the move into less developed parts of the world provides access to inexpensive labour, new sources of natural resources and new markets for product. This usually benefits both the company involved and the home economy by becoming more globally competitive and balancing trade. (Martin and Schinzinger, 291) There are also significant benefits for the developing countries as a result of such foreign investment: new employment opportunities for citizens with better pay and skill development, transfer of new advanced technology and the array of other social benefits that follow from an improved economic capability (e.g. education, health care.). (291)Martin and Schinzinger raise several moral issues relating to foreign activities including business and social complications. (Who loses jobs at home versus who gains? What are the local tax implications? What is the long term effect on the host country of selling off resources or accepting the influence of a foreign culture?) (292) "Culture" differences often cause the most debate

-a different value system, different religious beliefs and different business practices. This discussion focuses on the resulting moral and ethical considerations for corporations or individuals doing business with a foreign culture.

Cultural Concerns

The difference in values is a primary source of ethical concerns. As a starting premise we acknowledge that one's value system is related to the culture in which it was "acquired". Since values and ethics are intimately related, we first review three perspectives on "relative values / ethics" as described by Martin and Schinzinger (292)."

Ethical Relativism: Actions are morally right within a particular society when (and only because) they are approved by law, custom or other convention of that society." This is best summarized as "When in Rome, do as the Romans do." If liberally followed, this philosophy could lead to participation in some extreme, and generally unacceptablebehaviour (e.g. genocide, slavery). (292) If we accept that morally correct behaviour is based on fundamental human rights, then to ignore them simply becauseof a local convention would be to deny our own moral beliefs. While there are some arguments that would support acceptance of this philosophy, at least for some circumstances, its shortcomings are more evident if we apply this same philosophy to certain "sub-cultures" that exist in our own society (e.g. gangs, cults). If we consider that some of their behaviour may be unacceptable (or even illegal) in our "larger" society, then it would seem unreasonable that one could effectively change one's value system by joining such a group. (It is more likely that one would join such a group if one's value system already approximately matched that of the group!) To try to rationalize behaviour that did not fit with one's own value system would certainly create a moral dilemma. If we consider the entire planet as the "global society", then a country or area may be considered analogous to the sub-culture described above –i.e. a significantly different value system than the "global" one. Again, to try to rationalize a change in ethic because of a change in venue would certainly be just as ineffective. Of course one significant difference is the legal and political jurisdiction, where a "gang" is likely subject to the same laws as the rest of its enveloping society, this is not as yet true for different countries. However, an increasingly global economy is fuelling the pressure and support for more international law.

(Consider for a moment how one might define what the "global" value system actually is. As with any culture or sub -culture, it might be considered a statistical compilation of the values of allits members. This implies of course that one consider the frequency with which certain values are held and their weighting effect on the "global" result. This model also implies that there would be sub-sets in any larger group that might have a value system different enough from the global "norm" to be considered outcasts or splinter groups (recall gangs, cults).) In conclusion, "ethical relativism" as a view offers little to help guide our behaviour or resolve our moral dilemmas.

"Descriptive Relativism: As a matter of fact, value beliefs and attitudes differ from culture to culture." This philosophy simply acknowledges that there are differences in beliefs and values between different cultures. (292) It does not imply ethical relativism, nor does it offer any guidance to resolve moral dilemmas which arise because of these differences. It is however a partial step in that recognizing difference is at least the first step in dealing effectively with them.

"Moral Relationalism (or Contextualism): Moral judgments should be made in relation to factors that vary from case to case, usually making it impossible to formulate rules that are both simple and absolute. In particular, customs and laws are usually morally relevant factors that should be taken into account." (292) This is an extension of "Descriptive Relativism" that says one should not only acknowledge that there are differences in values and beliefs, but that one should consider these in the context of each situation when making moral and ethical decisions. It does not imply that these alternate views are either right or wrong; but it does imply that there may be more than one morally acceptable view in any situation (i.e. "ethical pluralism"). (293) Because the "context" of each situation is different, it is near impossible to establish any consistently applicable "rules". (Recall: This is reminiscent of Gilligan's view of "post conventional" moral development in which moral decisions are arrived at by considering the context of each situation.) It recognizes that moral rules almost always have exception (e.g. lying is generally considered morally unacceptable, but there are circumstances under which, at least in this philosophy, it would be considered morally correct). In summary, it recognizes that reasonable people can have different opinions about a moral issue and still be reasonable; and that different acts can be considered morally correct when taken in the context of the situation. While pragmatic or contextual considerations in a foreign environment may justify some digression from what is considered morally acceptable practice at home, it does not automatically justify participation in a foreign culture's practices without serious "examination of conscience" and at least some assessment of the long term effects. As a general guideline to assist in such decisions, consider the following suggestions:

• Identify the source of moral / ethical conflict

–what specific practice or act is in question and how does this differ from normal (at home) practice.

• Identify any local or foreign legal implications

–for example, while bribery per se is illegal in most places, there are some locales where it is tacitly condoned (at least in some circumstances) as evidenced by the complete lack of any enforcement of the applicable law. Occasionally there are local laws governing a companies behaviour even in when outside the country. Make sure you are not leaving yourself or your company open to litigation on either side.

• Make sure the practice is really accepted and understood to be part of the normal process. Example: while misleading advertising is not morally acceptable, deliberate exaggeration or obviously false claims are sometimes used to make a point. The key is that it is clearly understood, and expected to be understood by most people, that a certain statement is false and is not intended to mislead. This "understanding" is also culturally dependent.

• Consider the negative effects or the reason(s) why the practice or custom is not accepted locally; assess whether or not the practice would have the same effect in the other culture. Example: falsifying accounting records is generally considered unacceptable here because it would lead to illegal avoidance of taxes (for one) and others paying more to "take up the slack". If, however, it is considered common practice as the start of a negotiating process, then the same negative effect would likely not accrue.

• If the alternative is to not do business in the foreign location, then one may also try to balance the possible positive consequences of one's presence in the foreign location (e.g. jobs, improved local economy) against the negative effects of the practice. This can be a very difficult assessment and decision. Even the suggestion to "do more good than harm" is of limited help as even this assessment (especially if done in-house) is, at best,

subjective and possibly (probably?) biased! Another condition that may help put a bound on participation in foreign practices is to not violate any fundamental human rights. (Look to International bodies for declarations of human rights that are proposed for global acceptance.)

Culture-Transcending Norms

Harris et al consider the concept of behavioural norms that they feel represent values that are common to many cultures and should therefore be internationally applicable. While they acknowledge the difficulties in identifying and applying universally acceptable behaviours, they do offer another potential tool for the engineer to use when searching for a morally acceptable solution to inter-cultural issues. They draw these "CT norms" from the major ethical theories, international guidelines and documents, engineering codes of ethics and a basic respect for persons. From these sources, they identify nine behaviours which they suggest should be used to guide international operations:

1. Avoid unfair exploitation. Whenever there is an imbalance of power, economic or otherwise, there is opportunity to take unfair advantage. A foreign company, for example, may be in a controlling position with respect to local workers who desperately need the jobs and will accept an unfair wake or unsafe conditions because they feel they have no other choice. It is morally unacceptable to take such unfair advantage just because you can "call the shots".

2. Avoiding paternalism. The opposite of unfair exploitation is being too protective or paternalistic to the point that you are making all the decisions for someone else an the assumption you "know better". While it is appropriate to carefully consider whether someone has the stability, rationale and experience to make a sound decision on their own behalf, one must also judge when it would be beneficial and developmental to inform them of the choices and solicit at least their input if not allow then to decide for themselves.

3.Avoiding bribery and gifts. This is a very common and very difficult situation for many companies. In general, the use of monetary or other gifts to acquire an unfair advantage or for extortion is definitely unacceptable. However, their use as part of customary business dealings or "grease payments" has come to be accepted as a normal part of business in some cultures and could be morally justified. Bribery is universally illegal, be sure to carefully check relevant laws in both your country and the host country and make sure the practice is acceptable before finding yourself in serious difficulty.

4. Avoid violation of human rights. There is, as yet, no universally accepted list of basic human rights that can be applied in all locales. The United Nation's International Bill of Human Rights and related documents provide a "wish list" and excellent goal for all international operators. These should be observed as a minimum whenever possible. If this minimum doesn't meet your personal or corporate standards, choose the "higher road" while respecting local customs and laws as much as possible.

5. Promoting the welfare of the host country. An ethically sound foreign operation should be beneficial for both parties. Ensure that your presence provides a net benefit for the host. Here again, consideration of economic circumstances and safety issues must be considered contextually, bearing in mind the limits discussed elsewhere.

6. Respect local cultural norms and laws. This guide is clearly limited by the other CT norms. It may also create apparent conflicts. Harris et al suggest that in these cases, the local norms receive priority consideration unless they seriously violate one of the other norms. Here again, a reasoned judgment is likely to be more successful than arbitrarily imposing an unfamiliar and unwelcome change to a local culture.

7. Protect the health and safety of workers and residents. This is another tenet of engineering codes of ethics that must be carried over to international operations (public safety). One must consider the "appropriateness" of any technology being transferred giving due consideration to the local skill level and required training etc. and ensure that it is not creating a dangerous situation. While it is generally acceptable that working and living standards may not be equivalent to your home country, there are reasonable limits to how far one can ethically stray from sound engineering standards of practice.

8. Protect the environment. This again follows from many engineering codes of ethics. Since many developing nations have minimal environmental protection legislation in place, one must look to home standards or international bodies for guidelines to consider. Often protection of the environment is a lower priority for developing nations than economic development, and certainly some operational latitude is justifiable is the alternative is no developmental benefit for the host country at all. One cannot, obviously, ignore environmental issues to the point where it becomes a health or safety hazard for the residents or workers. When acceptable compromised are initially justified, one should at least planfor ultimately meeting internationally acceptable standard in the future.

9. Promote legitimate background institutions. This follows almost directly from CT norms 4,5 and possible 7. One cannot adequately honour human rights and bring a benefit to the residents (including safety and health) if your company is directly or indirectly supporting governments or institutions that do not apply these norms themselves. Donaldson insists that if one cannot operate without violating certain human rights, one must leave and find another place to operate. (296) Of course some practices generally considered violations of human rights may be locally accepted as customary rather than repression or harm; gender roles are one example. If one accepts that they must follow this local practice in order for the country to realize any benefits, include a plan to work respectfully with locals to improve standards in the long run. Many times there will be conflicts between these "norms", and they clearly can not all be met fully at the same time. When this occurs, the practitioner should consider reasonable trade-offs and strike a morally acceptable balance.Harris et al also give some additional suggestions that are intended to assist in their application:

1. Consider proportional responsibilities. Remember that although engineers may play a significant role in decisions regarding international operations, they are not professionally responsible for everything. They can legitimately limit their responsibilities to those matters over which they have some control.

2. Avoid laxness and rigorism. Strive for reasonable compromises where necessary. Ignoring all rules of behaviour or insisting on enforcing strict adherence to your version of what it right will more often than not lead to unnecessary complications.

3.How to choose between competing local and host practices. Providing they don't obviously violate other standardsor norms, the host country practices should be favoured whenever possible. This will show respect for the local people and their culture, and improve your company's relationship with your host.

4. How to choose between competing CT norms. Conflicts can also arise between CT norms. For example: "Eliminating the pollution [of a fertilizer plant] may result in an increase in the price of fertilizer and put it beyond the reach of most farmers in the country." (263) creates a conflict between CT norms 7 and 8 above. Although

Harris et al don't offer any advice for these situations, we would suggest adopting the utilitarian approach and favouring the option that provides the most overall good. Remember that evaluating "goodness" has its own set of challenges.

In an overview of the state of engineering in the new millennium, Wm. A. Wulf (2000), president of the NAE, introduced the concept of "macro ethical" behavior, that is , behavior that increases the intellectual pressure "to do the right thing" for the long-term improvement of society. Examples abound: the development of maintainable energy resources, the preservation of a healthy environment, the avoidance of ecological disasters, and universal education.

During the years I had the privilege of teaching in the engineering school at Princeton, I began the first class session of every semester by announcing that a gentleman had invented a new product that virtually everyone in the world would want to have—a product that would create millions of new jobs and would greatly improve the quality of most people's lives. Furthermore, as luck would have it, he was seeking investors. When asked, most students expressed significant interest in investing in his endeavor (at least hypothetically—after all, they were students!). But when I added, "Oh yes, there is one other thing—his invention will kill a quarter of a million people each year" and asked if they would still be interested in investing, no one showed any interest in such a reprehensible product. Furthermore, most said that any such product should be banned outright. I then told them that the inventor's name was Nicholas Joseph Cugnot—and his invention was the automobile. Imagine that you were responsible for the structural design of a building in Manhattan, the world's seventh tallest building, and that after the edifice was completed and fully occupied by its owners you, *and you alone,* discovered that there was an error in the design that could result in the structure's collapse in a type of storm that might be expected to occur every 16 years. What should you do? In this case, the "you" is Bill LeMessurier, a highly regarded structural engineer. He immediately informed the owner of the building and the authorities of the danger.

Or suppose you are a young, up-and-coming manager in a large corporation and that one day the chairman of the firm indicates to you that he is impressed with your work and is going to propose that you be elected to the board of directors. He goes on to say that there will be one condition: "You will always vote," he says, "exactly as I tell you." What should you do? In this case, the "you" is Herb Krannert—and his answer was simple. "I quit," he said. The following day six of his colleagues

showed up at his front door saying they heard what happened and they too had quit—and they wanted to go to work for *him*! Together, they formed the Inland Container Corporation.

Or suppose you are an engineer responsible for overseeing the research and development work of an aerospace corporation by which you are employed; the company is doing some very early research on stealth technology, in which it is investing significant sums of money. Independently, you are asked by the government to serve, in a personal capacity, as chairman of an outside advisory board. In carrying out your duties for the government, you become aware that the government is funding research on stealth technology at another company based on an altogether different technical approach that is far more advanced than the work being done by your own company. How do you carry out your responsibilities to your company—and yet honor your duty of privacy to your client, the U.S. government , and, indirectly, to its contractor on the project? In this case, I was "the engineer".

These three examples span the spectrum of ethics from macro ethics to micro ethics, and all of them involve engineering. Macro ethics involves ethical issues that affect large segments of society, whereas micro ethics involves issues that affect a smaller, more immediate group, such as one's boss or one's client.

Collective bargaining

Collective bargaining consists of negotiations between an employer and a group of employees so as to determine the conditions of employment. The result of collective bargaining procedures is a collective agreement. Employees are often represented in bargaining by a union or other labor organization. Collective bargaining is governed by federal and state statutory laws, administrative agency regulations, and judicial decisions. In areas where federal and state law overlap, state laws are preempted. The main body of law governing collective bargaining is the National Labor Relations Act (NLRA). It explicitly grants employees the right to collectively bargain and join trade unions. The NLRA was originally enacted by Congress in 1935 under its power to regulate interstate commerce. It applies to most private non-agricultural employees and employers engaged in some aspect of interstate commerce. Decisions

and regulations of the National Labor Relations Board, which was established by the NLRA, greatly supplement and define the provisions of the act.

The NLRA establishes procedures for the selection of a labor organization to represent a unit of employees in collective bargaining. The act prohibits employers from interfering with this selection. The NLRA requires the employer to bargain with the appointed representative of its employees. It does not require either side to agree to a proposal or make concessions but does establish procedural guidelines on good faith bargaining. Proposals which would violate the NLRA or other laws may not be subject to collective bargaining. The NLRA also establishes regulations on what tactics (e.g. strikes, lock-outs, picketing) each side may employ to further their bargaining objectives.

State laws further regulate collective bargaining and make collective agreements enforceable under state law. They may also provide guidelines for those employers and employees not covered by the NLRA, such as agricultural laborers.

Arbitration is a method of dispute resolution used as an alternative to litigation. It is commonly designated in collective agreements between employers and employees as the way to resolve disputes. The parties select a neutral third party (an arbiter) to hold a formal or informal hearing on the disagreement. The arbiter then issues a decision binding on the parties. Both federal and state law governs the practice of arbitration. While the Federal Arbitration Act, by its own terms, is not applicable to employment contracts, federal courts are increasingly applying the law in labor disputes. Fourty-nine states have adopted the Uniform Arbitration Act (1956) as state law. Thus, the arbitration agreement and decision of the arbiter may be enforceable under state and federal law.

Freedom of association ensures that workers and employers can associate to efficiently negotiate work relations. Combined with strong freedom of association, sound collective bargaining practices ensure that employers and workers have an equal voice in negotiations and that the outcome will be fair and equitable. Collective bargaining allows both sides to negotiate a fair employment relationship and prevents costly labour disputes. Indeed, some research has indicated that countries with highly coordinated collective bargaining tend to have less inequality in wages, lower and less persistent unemployment, and fewer and shorter strikes than countries where collective bargaining is less established. Established collective bargaining practices were an element that allowed the Republic of Korea to weather the Asian financial crisis and enabled South Africa to make a relatively peaceful transition into the post-apartheid era. ILO standards promote collective bargaining and help to ensure that good labour relations benefit everyone.

Respect Authority

According to a traditional image, “true professionals” are independent agents who, unlike businesspersons, serve clients without having to submit to the authority of managers. With the advent of managed health care and large legal offices, most physicians and attorneys now work within authority-structured corporations. Indeed, all issues in professional ethics, not only those surrounding personal commitments, increasingly concern interactions between professionals and their organizations, and also among members of different professions. This chapter discusses three aspects of shared responsibility: the interplay between professionals' authority as experts and managers' authority within organizations, the possibility of corporations and professionals serving shared or widely overlapping goals, and how respect for authority is compatible in principle with professional autonomy. It also explores professionals' right of conscience that leaves room for personal ideals within authority relationships. Although the focus is on the profession of engineering, the main points apply to all professions.

Senior team members, coming from a traditional project setting to an Agile project might face a situation, where they feel that they are not adequately respected for their seniority. In certain circumstances they find it hard to adjust in Agile teams.

In an interesting thread running in parallel on Scrum Development group and Agile India group Vikram Dhiman brought an interesting situation for discussion. He shared an incident of a company in which 4 senior technical

people refused to join the Agile team because they anticipated inadequate respect and authority. The senior members felt that their experience would be dishonored if they had to work in a team in which the only metric relevant was “team success”. As per Vikram one of the senior member said

I have slogged hard for over 06 years to reach where I have. I don't have an issue working with people much less in experience - I would learn something from them too. But, I find it degrading to discredit all my 06 years of experience. How do I know I have grown if all the time its just "team's success" that is the metric. Again, I am not against the team - I just want respect and slight authority.

Vikram further added

In older hierarchy - you had two paths of growth: technical [tech architect, enterprise designer etc] and managerial. How do we show this to the people in an Agile set up so that you do not end up losing good and experienced people?

Giving some support to the argument, Pankaj Chawla suggested that authority and power, in any sphere of life, do decide who will survive and who will perish. He quoted an example from animal kingdom where the animals with less power always perish in the battle of supremacy. He added that, though businesses work on the notion on increasing value of differentiation however, Agile tends to put all the team members in the same bucket.

Most of the other members on both the groups were unanimous in stating that authority and respect do not necessarily come from the years of experience a person has. Respect and authority are earned with the actions that one performs. Ajay Danait added that true leaders would not quit if they are not given authority, they would rather enable authority through consensus building.

So is there a way in which the senior members from a traditional setup ease their way into an Agile team?

Guido Schoonheim suggested that the team principle of “everyone is the same” indeed does not go well with the senior members. In his view to take care of the situation the teams should start with a norming session where the roles and standards are decided on. Then the senior members of the team, on account of their experience, should be made responsible for the project quality and mentorship. This would make the senior member make use of his experience.

Peter Goldey provided his thoughts on the aspect of recognition and growth. He suggested that even though the most important metric is team success it does not mean that metrics to measure an individual's performance do not exist. According to him, if one of a pair of individuals is performing better than the rest, then they would automatically get noticed. Now it is upto the Scrum master to reward the individuals accordingly.

So how does a team measure success of an individual so that he does not feel that his efforts are going unnoticed? How does an Agile team define the career progression for senior members?

Richard Banks suggested an MVP award where each member of the team votes for the most valuable player. He also suggests that senior people on the team should be valued for their experience and their progress should depend on their contributions and how their peers value their work.

David A Barrett added that with time the definition of great programmer has undergone a change. Initially great programmers were the ones who were technically sound, the next generation required them to have skills to relate to the community and the business, now the definition of great programmers has changed further. According to him

Now, I'd say that a "great" programmer needs to be able to work in a team environment. There's a whole new set of skills to be learned - things like influencing without authority - and personality traits that lead to success. To me, the effectiveness of Scrum (and Agile in general) is what makes this latest paradigm shift inevitable.

In conclusion David and Pankaj made somewhat tangent remarks. This is what they had to say

Dave Nicolette concluded that he would consider people who feel disregarded in Agile teams more as a personality issue. He suggests that Agile is a very different way of working and not everyone enjoys working in Agile teams. The key is to get people with the right frame of mind who can contribute with the team for the success of the project.

Pankaj made a very interesting comment. He suggested

The basic problem is that Agile is a very engineering solution created by engineers for a problem that is engineering in nature but is vastly a human problem (productivity, motivation, teaming etc) and like most engineering solutions to human problems this one will also show its weaknesses as more and more humans embrace it. The good thing is that Agile is based on the foundation of iterative improvement and embracing change and I hope that Agile will use its own founding principles to do course correction and find a better solution to a changing requirement of showing a 25 year career path to guys in the technical ladder.

Members on the Scrum Development and Agile India groups were unanimous that respect and authority need to be earned. They cannot be assumed on the basis of seniority. However, there was a small undercurrent in the threads which suggested that Agile might still have to provide some answers to senior members in terms of career path and growth.

How can people be influenced to make commitments to the goals of the organization? In part, this question can be answered by how managers define and use power, influence, and authority. Deciding what type of authority system to create is part of the managerial responsibility of organizing. Compare, for example, two managers. One accepts or rejects all ideas generated at lower levels. The other gives the authority for making some decisions to employees at the level where these decisions will most likely affect those employees. How managers use their power, influence, and authority can determine their effectiveness in meeting the goals of the organization.

RESPONSIBILITY

Responsibility is the obligation to accomplish the goals related to the position and the organization. Managers, at no matter what level of the organization, typically have the same basic responsibilities when it comes to managing the work force: Direct employees toward objectives, oversee the work effort of employees, deal with immediate problems, and report on the progress of work to their superiors. Managers' primary responsibilities are to examine tasks, problems, or opportunities in relationship to the company's short-and long-range goals. They must be quick to identify areas of potential problems, continually search for solutions, and be alert to new opportunities and ways to take advantage of the best ones. How effectively goals and objectives are accomplished depends on how well the company goals are broken down into jobs and assignments and how well these are identified and communicated throughout the organization.

INFLUENCE AND POWER

Formal job definitions and coordinating strategies are not enough to get the work done. Managers must somehow use influence to encourage workers to action. If they are to succeed, managers must possess the ability to influence organization members. Influence is the ability to bring about change and produce results; people derive influence from interpersonal power and authority. Interpersonal power allows organization members to exert influence over others.

Power stems from a variety of sources: reward power, coercive power, information power, resource power, expert power, referent power, and legitimate power. *Reward power* exists if managers provide or withhold rewards, such as money or recognition, from those they wish to influence. *Coercive power* depends on the manager's ability to punish others who do not engage in the desired behavior. A few examples of coercion include reprimands, criticisms, and negative performance appraisals. Power can also result from controlling access to important *information* about daily operations and future plans. Also, having access to and deciding to limit or share the *resources* and materials that are critical to accomplishing objectives can provide a manager with a source of power. Managers usually have access to such information and resources and must use discretion over how much or how

little is disseminated to employees. *Expert power* is based on the amount of expertise a person possesses that is valued by others. For example, some people may be considered experts with computers if they are able to use several software programs proficiently and can navigate the Internet with ease. Those who do not have the expert knowledge or experience need the expert's help and, therefore, are willing to be influenced by the expert's power. When people are admired or liked by others, *referent power* may result because others feel friendly toward them and are more likely to follow their directions and demonstrate loyalty toward them. People are drawn to others for a variety of reasons, including physical or social attractiveness, charisma, or prestige. Such politicians as John F. Kennedy were able to use their referent power to effectively influence others. *Legitimate power* stems from the belief that a person has the right to influence others by virtue of holding a position of authority, such as the authority of a manager over a subordinate or of a teacher over a student.

In some respects, everyone has power to either push forward or obstruct the goals of the organization by making decisions, delegating decisions, delaying decisions, rejecting decisions, or supporting decisions. However, the effective use of power does not mean control. Power can be detrimental to the goals of the organization if held by those who use it to enhance their own positions and thereby prevent the advancement of the goals of the organization.

Truly successful managers are able to use power ethically, efficiently, and effectively by sharing it. Power can be used to influence people to do things they might not otherwise do. When that influence encourages people to do things that have no or little relationship to the organization's goals, that power is abused. Abuses of power raise ethical questions. For example, asking a subordinate to submit supposed business-trip expenses for reimbursement for what was actually a family vacation or asking a subordinate to run personal errands is an abuse of power. People who acquire power are ethically obligated to consider the impact their actions will have on others and on the organization.

Employees may desire a greater balance of power or a redistribution of authority within the existing formal authority structure. People can share power in a variety of ways: by providing information, by sharing responsibility, by giving authority, by providing resources, by granting access, by giving reasons, and by extending emotional support. The act of sharing information is powerful. When people don't share information, the need to know still exists; therefore, the blanks are filled in with gossip and innuendo. When people are asked to take on more responsibility, they should be provided with tasks that provide a challenge, not just with more things to increase their workload that don't really matter. People need the legitimate power to make decisions without having to clear everything first with someone higher up in the organization. People who have power must also have the necessary range of resources and tools to succeed. Access to people outside as well as inside the organization should be provided and encouraged. People should be told why an assignment is important and why they were chosen to do it. Emotional support can come in the form of mentoring, appreciation, listening, and possibly helping out.

Sharing power or redistributing authority does not necessarily mean moving people into positions of power; instead, it can mean letting people have power over the work they do, which means that people can exercise personal power without moving into a formal leadership role. The ability to influence organization members is an important resource for effective managers. Relying on the title "boss" is seldom powerful enough to achieve adequate influence.

AUTHORITY

Authority is seen as the legitimate right of a person to exercise influence or the legitimate right to make decisions, to carry out actions, and to direct others. For example, managers expect to have the authority to assign work, hire employees, or order merchandise and supplies.

As part of their structure, organizations have a formal authority system that depicts the authority relationships between people and their work. Different types of authority are found in this structure: line, staff, and functional authority. Line authority is represented by the chain of command; an individual positioned above another in the hierarchy has the right to make decisions, issue directives, and expect compliance from lower-level employees. Staff authority is advisory authority; it takes the form of counsel, advice, and recommendation. People with staff

authority derive their power from their expert knowledge and the legitimacy established in their relationships with line managers. Functional authority allows managers to direct specific processes, practices, or policies affecting people in other departments; functional authority cuts across the hierarchical structure. For example, the human resources department may create policies and procedures related to promoting and hiring employees throughout the entire organization.

Authority can also be viewed as arising from interpersonal relationships rather than a formal hierarchy. Authority is sometimes equated with legitimate power. Authority and power and how these elements are interrelated can explain the elements of managing and their effectiveness. What is critical is how subordinates perceive a manager's legitimacy. Legitimate authority occurs when people use power for good and have acquired power by proper and honest means. When people perceive an attempt at influence as legitimate, they recognize it and willingly comply. Power acquired through improper means, such as lying, withholding information, gossip, or manipulation, is seen as illegitimate. When people perceive the authority of others as illegitimate, they are less likely to willingly comply.

DELEGATION

In order for managers to achieve goals in an efficient manner, part of their work may be assigned to others. When work is delegated, tasks and authority are transferred from one position to another within an organization. The key to effective delegation of tasks is the transference of decision-making authority and responsibility from one level of the organization to the level to which the tasks have been delegated. In order to effectively delegate work, some guidelines should be followed: Determine what each worker can most effectively accomplish; decide whether the worker should just identify a problem or also propose a solution; consider whether the person can handle the challenge of the task; be clear in the objectives of the task; encourage questions; explain why the task is important; determine if the person has the appropriate resourcesime, budget, data, or equipmento get the job done on a deadline; create progress reviews as part of the project planning; and be prepared to live with less than perfect results. Authority should be delegated in terms of expected results. Generally, the more specific the goal, the easier it is to determine how much authority someone needs.

Some employees resist delegation for a variety of reasons. Initiative and responsibility involve risk that some people try to avoid. People tend to play it safe if risk results in criticism. Those who feel they already have more work than they can do avoid new assignments. Some people doubt their own abilities and lack the self-confidence to tackle new assignments. Delegation is an excellent professional development tool so long as it expands a worker's expertise and growth. Delegation can also compensate for a manager's weakness. A successful team is developed by building on the strengths of its members.

People develop most when stimulated to broaden themselves than challenged. More authority can add challenge; too much challenge, however, can frustrate people and cause them to avoid new responsibilities. Delegation should involve acceptable challenge enough to motivate but not so much as to frustrate.

In today's workplace, managers are compelled to rely more on persuasion, which is based on expert and referent power rather than reward, coercive, or inappropriate use of power. A manager who shares power and authority will be the one with the greatest ability to influence others to work toward the goals of the organization.

Conflict of Interest

Conflict of interest arises in the workplace when an employee has competing interests or loyalties that either are, or potentially can be, at odds with each other. A conflict of interest causes an employee to experience a struggle between diverging interests, points of view, or allegiances. Conflicts of interest are generally forbidden in company codes of conduct and / or employee handbooks.

Addressing conflicts of interest

- Faithful Agent and Trustee
- Avoid vs. Disclosure

-‘Appearances’

- Acceptance of Compensation from More Than One Party
- Serving on Public Bodies
- Accepting Contracts from Government Bodies
- Part-Time Engineering Work
- Contingent Fee Arrangements
- Representing Adversary Interests
- Consent

Professional Rights

The engineer’s problem has centered on a conflict between professional independence and bureaucratic loyalty, rather than between workmanlike and predatory instincts.

Edwin T. Layton, Jr.

Professional Rights

Engineers as professionals also have special rights arise from their professional role. Those include:

- Basic right of professional conscience (right to exercise professional judgement in pursuing professional obligations)
- Right to refuse to engage in unethical activity
- Right to express one’s professional judgement, including right to dissent
- Right to warn the public of dangers
- Right to fair recognition and remuneration for professional services

Employee Rights

An employee rights are any rights that apply or refer to the status of employees. It can be categorised as contractual and non-contractual rights.

a) Contractual right arise solely out of an employee contract created by organisational policies or contracts. For example, right to receive a salary of certain amount.

b) Non-contractual rights exist even if not formally recognised in a contract or company policy, such as

- Right to choose outside activities
- Right to privacy and employer confidentiality
- Right to due process from employer
- Right to non-discrimination and absence of sexual harassment at the workplace

Engineers have several types of moral rights, which fall into sometimes overlapping categories of human, employee, contractual, and professional rights.

As human beings, engineers have fundamental right to live and freely pursue their legitimate personal interests.

In particular, they have a human right to pursue their work and not to be unfairly discriminated against in employment on the basis of sex, race, or age.

Professional and employee rights can be justified by reference to ethical theories.

1. A rights theory would derive the right of professional conscience from a fundamental human right to pursue legitimate interests, where such interests include moral obligations.

2. A duty theory might appeal to the fundamental human duty employers have not to harm others (e.g., the public) by handicapping engineers seeking to meet their professional obligations.

3. A utilitarian theory would argue that the greatest good is promoted by allowing engineers to pursue their obligations.

In general, the importance of professional duties means that the importance of the right to meet those duties must be recognised.

Laws, Codes and Behaviour

Behavior Continuum (Relationship of Laws and Codes to standards of ethical behavior) Consider the representation below where behavior has been shown as a continuum. The extremes may be "Selfish" and Altruistic" as shown, or perhaps as 100% unacceptable and 100% acceptable

(e.g. everyone agrees that a certain act or behavior is unacceptable at one extreme, and everyone agrees that a certain behavior is acceptable at the other extreme.)

Engineers as Responsible Experimenters:

To fulfill their obligations as responsible experimenters, engineers must:

-protect the safety of human subjects, providing a safe exit whenever possible, and respect their right of informed consent

- use imaginative forecasting of possible side effects, and reasonable efforts to monitor them

- have autonomous, personal involvement in all aspects of a project

- accept accountability for the results

-display technical competence and other attributes of responsible professionals

(Martin & Schinzinger, 89)

Remember, informing for consent requires excellent communications skills in order to

provide appropriate information in an understandable way. Also, cooperation with other disciplines is often essential to assess potential side effects and monitor effects of "social experiments" through engineering.. (Recall Alasdair MacIntyre's virtue of professional responsibility which includes: i) self direction, ii) public spirited, iii)

team work, iv) proficiency. (Martin & Schinzinger, 42))

Confidentiality

Confidentiality is one of the most central and widely acknowledged duties of most professionals. Indeed, information gained in confidence can be considered part of engineers' "specialized" knowledge which is required to do their job properly and professionally. To discuss the related issues, we

first refer to a few definitions (Martin and Schinzinger, 208 –210):

-confidential information is any information deemed desirable to keep secret

-privileged information is often used as a synonym for "confidential, but literally means available only on the basis of special privilege.

-proprietary information is information that a company owns or is the proprietor of, often considered as an asset which can be protected by law from use by others.

-trade secrets are another form of proprietary information which is any type of information that has not become public and which an employer has taken steps to keep secret.

-patents are a method of legal protection of ideas for a specified period (currently 20 years in Canada). Patents and trade secrets have the same objectives but each has its advantages and disadvantages. While patents offer some legal protection, they necessarily reveal some aspects of the idea in the public forum which can lead to improvement and use by others (which is indeed one of the reasons for the patent process). Trade secrets can keep all aspects of an idea from the public, but should it leak out (through a former employee or espionage), there is no legal way to prevent its use.

Normal reason would dictate that an engineer has a firm obligation to their employer or client to keep information confidential. In most cases, the professional requires all relevant information in order to do the best job for their client. Trusting that this information will be kept confidential helps facilitate this relationship and a quality result. In the case of corporate secrets, it can be argued that it is also in the public's interest to allow innovative companies the opportunity to recoup their development costs by exploiting their inventions, and engineers should do their part to support this process.

One set of issues has to do with determining what information is confidential, for how long, and under what circumstances. Certainly the circumstances where public safety is at stake may warrant exceptions to otherwise strict rules (Martin and Schinzinger, 212), but again each situation should be studied carefully. Generally, information that someone outside a company or client relationship could obtain legal access to by some other means would not be considered confidential. For example, this could include some information included in patent applications or public annual reports. Remember however that interpretation of that information may not be easily accessible, and engineers are often asked to interpret technical information. (Remember one's obligation to one's client or employer to protect their interests. If in doubt -speak not!) As for timeframe, until it's public, it's confidential!

One of the trickiest situations that may be encountered is when an engineer changes employers. Usually there is an implied confidentiality agreement if not an explicit one. This is especially an issue when an engineer goes to work for another company in the same line of business. It should be clear that an engineer cannot directly use any trade secrets or proprietary information in order to give their new employer a competitive advantage (even though in some industries this is a common practice to acquire new knowledge or technology!). The issue is much more subtle when it comes to expertise the engineer has developed that is more general in nature. Generally, it is becoming recognized that much of the knowledge developed on the job is owned as much by the engineer as the company, and it is their right to look after their own self interests and better their situation (Martin and Schinzinger, 213). Of course, each situation is unique, and should be examined carefully with respect to possible confidentiality infringements. In recent times, explicit confidentiality agreements have attempted to strike a reasonable middle ground by either offering incentives to departing employees to keep secrets, or by specifying conditions or timeframes thus making the decisions clearer. (214) However, an explicit agreement is not an excuse to ignore one's moral obligations (recall the potential effect of following just the letter of the law!).

Plagiarism

Plagiarism is defined in multiple ways in higher education institutions and universities. For example:

- Stanford sees plagiarism as the "use, without giving reasonable and appropriate credit to or acknowledging the author or source, of another person's original work, whether such work is made up of code, formulas, ideas, language, research, strategies, writing or other form."
- Yale views plagiarism as the "use of another's work, words, or ideas without attribution" which includes "using a source's language without quoting, using information from a source without attribution, and paraphrasing a source in a form that stays too close to the original."
- Princeton perceives plagiarism as the "deliberate" use of "someone else's language, ideas, or other original (not common-knowledge) material without acknowledging its source."
- Oxford characterizes plagiarism as the use of "a writer's ideas or phraseology without giving due credit.";
- Brown defines plagiarism to be "appropriating another person's ideas or words (spoken or written) without attributing those word or ideas to their true source".

Sanctions for student plagiarism

In the academic world, plagiarism by students is usually considered a very serious offense that can result in punishments such as a failing grade on the particular assignment, the entire course, or even being expelled from the institution. Generally, the punishment increases as a person enters higher institutions of learning. For cases of repeated plagiarism, or for cases in which a student commits severe plagiarism (e.g., submitting a copied piece of writing as original work), suspension or expulsion is likely. A plagiarism tariff has been devised for UK higher education institutions in an attempt to encourage some standardization of this academic problem.

Eight Cardinal Rules of Academic Integrity

1. **Know your rights.** Do not let other students in your class diminish the value of your achievement by taking unfair advantage. Report any academic dishonesty you see.
2. **Acknowledge your sources.** Whenever you use words or ideas that are not your own when writing a paper, use quotation marks where appropriate and cite your source in a footnote, and back it up at the end with a list of sources consulted.
3. **Protect your work.** In examinations, do not allow your neighbors to see what you have written; you are the only one who should receive credit for what you know.
4. **Avoid suspicion.** Do not put yourself in a position where you can be suspected of having copied another person's work, or of having used unauthorized notes in an examination. Even the appearance of dishonesty may undermine your instructor's confidence in your work.
5. **Do your own work.** The purpose of assignments is to develop your skills and measure your progress. Letting someone else do your work defeats the purpose of your education, and may lead to serious charges against you.
6. **Never falsify a record or permit another person to do so.** Academic records are regularly audited and students whose grades have been altered put their entire transcript at risk.
7. **Never fabricate data, citations, or experimental results.** Many professional careers have ended in disgrace; even years after the fabrication first took place.
8. **Always tell the truth when discussing your work with your instructor.** Any attempt to deceive may destroy the relation of teacher and student.

How to Avoid Plagiarism

Northwestern's "Principles Regarding Academic Integrity" defines plagiarism as "submitting material that in part or whole is not entirely one's own work without attributing those same portions to their correct source." Plagiarism can

occur in many forms besides writing: art, music, computer code, mathematics, and scientific work can also be plagiarized. This document pays special attention to plagiarism in writing, but it is important to understand that unauthorized collaboration in a math or science assignment is also plagiarism.

In all academic work, and especially when writing papers, we are building upon the insights and words of others. A conscientious writer always distinguishes clearly between what has been learned from others and what he or she is personally contributing to the reader's understanding. To avoid plagiarism, it is important to understand how to attribute words and ideas you use to their proper source.

Guidelines for Proper Attribution

Everyone in the university needs to pay attention to the issue of proper attribution. All of us--faculty and students together--draw from a vast pool of texts, ideas, and findings that humans have accumulated over thousands of years; we could not think to any productive end without it. Even the sudden insights that appear at first glance to arrive out of nowhere come enmeshed in other people's thinking. What we call originality is actually the innovative combining, amending, or extending of material from that pool.

Hence each of us must learn how to declare intellectual debts. Proper attribution acknowledges those debts responsibly, usefully, and respectfully. An attribution is responsible when it comes at a location and in a fashion that leaves readers in no doubt about whom you are thanking for what. It is useful when it enables readers to find your source readily for themselves. You help them along the way, just as that same source helped you along yours. To make sure that our attributions are useful, we double-check them whenever we can. Quite literally, it is a habit that pays. Colleagues in every field appreciate the extra care. Nothing stalls a career faster than sloppy, unreliable work.

Finally, an attribution is respectful when it expresses our appreciation for something done well enough to warrant our borrowing it. We should take pride in the intellectual company we keep. It speaks well of us that we have chosen to use the work of intelligent, interesting people, and we can take genuine pleasure in joining our name with theirs.

Intellectual property (IP)

Intellectual property (IP) is a legal concept which refers to creations of the mind for which exclusive rights are recognized. Under intellectual property law, owners are granted certain exclusive rights to a variety of intangible assets, such as musical, literary, and artistic works; discoveries and inventions; and words, phrases, symbols, and designs. Common types of intellectual property rights include copyright, trademarks, patents, industrial design rights, trade dress, and in some jurisdictions trade secrets.

Although many of the legal principles governing intellectual property rights have evolved over centuries, it was not until the 19th century that the term *intellectual property* began to be used, and not until the late 20th century that it became commonplace in the majority of the world.[2

Objectives

The stated objective of most intellectual property law (with the exception of trademarks) is to "Promote progress."[21] By exchanging limited exclusive rights for disclosure of inventions and creative works, society and the patentee/copyright owner mutually benefit, and an incentive is created for inventors and authors to create and disclose their work. Some commentators have noted that the objective of intellectual property legislators and those who support its implementation appears to be "absolute protection." "If some intellectual property is desirable because it encourages innovation, they reason, more is better. The thinking is that creators will not have sufficient incentive to invent unless they are legally entitled to capture the full social value of their inventions." [22] This absolute protection or full value view treats intellectual property as another type of 'real' property, typically adopting its law and rhetoric. Other recent developments in intellectual property law, such as the America Invents Act, stress international harmonization.

Criticisms of IPR

"Copying is not theft!" badge with a character resembling Mickey Mouse in reference to the in popular culture rationale behind the Sonny Bono Copyright Term Extension Act of 1998

Some critics of intellectual property, such as those in the free culture movement, characterize it as intellectual protectionism, intellectual monopoly or government-granted monopoly, and argue the public interest is harmed by protectionist legislation such as copyright extension, software patents and business method patents. A critique against the idea of *intellectual property* has been formulated by Eben Moglen in his *dotCommunist Manifesto*:

Society confronts the simple fact that when everyone can possess every intellectual work of beauty and utility—reaping all the human value of every increase of knowledge—at the same cost that any one person can possess them, it is no longer moral to exclude. If Rome possessed the power to feed everyone amply at no greater cost than that of Caesar's own table, the people would sweep Caesar violently away if anyone were left to starve. But the bourgeois system of ownership demands that knowledge and culture be rationed by the ability to pay.

Objections to overbroad intellectual property laws

Some critics of intellectual property, such as those in the free culture movement, point at intellectual monopolies as harming health (in the case of pharmaceutical patents), preventing progress, and benefiting concentrated interests to the detriment of the masses,[53][54][55][56] and argue that the public interest is harmed by ever expansive monopolies in the form of copyright extensions, software patents, and business method patents. More recently scientists and engineers are expressing concern that patent thickets are undermining technological development even in high-tech fields such as nanotechnology.[57]

Peter Drahos notes that "Property rights confer authority over resources. When authority is granted to the few over resources on which many depend, the few gain power over the goals of the many. This has consequences for both political and economic freedoms with in a society."[58]:13

The World Intellectual Property Organization (WIPO) recognizes that conflicts may exist between the respect for and implementation of current intellectual property systems and other human rights.[59] In 2001 the UN Committee on Economic, Social and Cultural Rights issued a document called "Human rights and intellectual property" that argued that intellectual property tends to be governed by economic goals when it should be viewed primarily as a social product; in order to serve human well-being, intellectual property systems must respect and conform to human rights laws. According to the Committee, when systems fail to do so they risk infringing upon the human right to food and health, and to cultural participation and scientific benefits.[60][61] In 2004 the General Assembly of WIPO adopted *The Geneva Declaration on the Future of the World Intellectual Property Organization* which argues that WIPO should "focus more on the needs of developing countries, and to view IP as one of many tools for development—not as an end in itself".[62]

Further along these lines, The ethical problems brought up by IP rights are most pertinent when it is socially valuable goods like life-saving medicines are given IP protection. While the application of IP rights can allow companies to charge higher than the marginal cost of production in order to recoup the costs of research and development, the price may exclude from the market anyone who cannot afford the cost of the product, in this case a life-saving drug. "An IPR driven regime is therefore not a regime that is conductive to the investment of R&D of products that are socially valuable to predominately poor populations...."

Some libertarian critics of intellectual property have argued that allowing property rights in ideas and information creates artificial scarcity and infringes on the right to own tangible property. Stephan Kinsella uses the following scenario to argue this point:

[I]magine the time when men lived in caves. One bright guy—let's call him Galt-Magnon—decides to build a log cabin on an open field, near his crops. To be sure, this is a good idea, and others notice it. They naturally imitate Galt-Magnon, and they start building their own cabins. But the first man to invent a house, according to IP

advocates, would have a right to prevent others from building houses on their own land, with their own logs, or to charge them a fee if they do build houses. It is plain that the innovator in these examples becomes a partial owner of the tangible property (e.g., land and logs) of others, due not to first occupation and use of that property (for it is already owned), but due to his coming up with an idea. Clearly, this rule flies in the face of the first-user homesteading rule, arbitrarily and groundlessly overriding the very homesteading rule that is at the foundation of all property rights.

Thomas Jefferson once said in a letter to Isaac McPherson on August 13, 1813:

"If nature has made any one thing less susceptible than all others of exclusive property, it is the action of the thinking power called an idea, which an individual may exclusively possess as long as he keeps it to himself; but the moment it is divulged, it forces itself into the possession of every one, and the receiver cannot dispossess himself of it. Its peculiar character, too, is that no one possesses the less, because every other possesses the whole of it. He who receives an idea from me, receives instruction himself without lessening mine; as he who lights his taper at mine, receives light without darkening me."

In 2005 the RSA launched the Adelphi Charter, aimed at creating an international policy statement to frame how governments should make balanced intellectual property law.

Another limitation of current U.S. Intellectual Property legislation is its focus on individual and joint works; thus, copyright protection can only be obtained in 'original' works of authorship. This definition excludes any works that are the result of community creativity, for example Native American songs and stories; current legislation does not recognize the uniqueness of indigenous cultural 'property' and its ever-changing nature. Simply asking native cultures to 'write down' their cultural artifacts on tangible mediums ignores their necessary orality and enforces a Western bias of the written form as more authoritative

Computer Ethics is a branch of practical philosophy which deals with how computing professionals should make decisions regarding professional and social conduct.[1] Margaret Anne Pierce, a professor in the Department of Mathematics and Computers at Georgia Southern University has categorized the ethical decisions related to computer technology and usage into 3 primary influences:

- 1. The individual's own personal code.
- 2. Any informal code of ethical conduct that exists in the work place.
- 3. Exposure to formal codes of ethics.

Foundation

To understand the foundation of computer ethics, it is important to look into the different schools of ethical theory. Each school of ethics influences a situation in a certain direction and pushes the final outcome of ethical theory.

Relativism is the belief that there are no universal moral norms of right and wrong. In the school of relativistic ethical belief, ethicists divide it into two connected but different structures, subject (Moral) and culture (Anthropological). Moral relativism is the idea that each person decides what is right and wrong for them. Anthropological relativism is the concept of right and wrong is decided by a society's actual moral belief structure.

Deontology is the belief that people's actions are to be guided by moral laws, and that these moral laws are universal. The origins of Deontological Ethics are generally attributed to the German philosopher Immanuel Kant and his ideas concerning the Categorical Imperative. Kant believed that in order for any ethical school of thought to apply to all rational beings, they must have a foundation in reason. Kant split this school into two categorical imperatives. The first categorical imperative states to act only from moral rules that you can at the same time will to be universal moral laws. The second categorical imperative states to act so that you always treat both yourself and other people as ends in themselves, and never only as a means to an end.

Utilitarianism is the belief that if an action is good it benefits someone and an action is bad if it harms someone. This ethical belief can be broken down into two different schools, Act Utilitarianism and Rule Utilitarianism. Act Utilitarianism is the belief that an action is good if its overall effect is to produce more happiness than unhappiness. Rule Utilitarianism is the belief that we should adopt a moral rule and if followed by everybody, would lead to a greater level of overall happiness.

Social contract is the concept that for a society to arise and maintain order, a morality based set of rules must be agreed upon. Social contract theory has influenced modern government and is heavily involved with societal law. Philosophers like John Rawls, Thomas Hobbes, John Locke, and Jean-Jacques Rousseau helped created the foundation of social contract.

Virtue Ethics is the belief that ethics should be more concerned with the character of the moral agent (virtue), rather than focusing on a set of rules dictating right and wrong actions, as in the cases of deontology and utilitarianism, or a focus on social context, such as is seen with Social Contract ethics. Although concern for virtue appears in several philosophical traditions, in the West the roots of the tradition lie in the work of Plato and Aristotle, and even today the tradition's key concepts derive from ancient Greek philosophy.

The conceptual foundations of computer ethics are investigated by information ethics, a branch of philosophical ethics established by Luciano Floridi. The term computer ethics was first coined by Dr. Walter Maner, a professor at Boston University. Since the 1990s the field has started being integrated into professional development programs in academic settings.

History

The concept of computer ethics originated in 1950 when Norbert Wiener, an MIT professor and inventor of an information feedback system called "cybernetics", published a book called "The Human Use of Human Beings" which laid out the basic foundations of computer ethics and made Norbert Wiener the father of computer ethics.

Later on, in 1966 another MIT professor by the name of Joseph Weizenbaum published a simple program called ELIZA which performed natural language processing. In essence, the program functioned like a psychotherapist where the program only used open ended questions to encourage patients to respond. The program would apply pattern matching pattern rules to human statements to figure out its reply.

A bit later during the same year the world's first computer crime was committed. A programmer was able to use a bit of computer code to stop his banking account from being flagged as overdrawn. However, there were no laws in place at that time to stop him, and as a result he was not charged. To make sure another person did not follow suit, an ethics code for computers was needed.

Sometime further into the 1960s Donn Parker, who was an author on computer crimes, led to the development of the first code of ethics in the field of computer technology.

In 1970, a medical teacher and researcher, by the name of Walter Manner noticed that ethical decisions are much harder to make when computers are added. He noticed a need for a different branch of ethics for when it came to dealing with computers. The term "Computer ethics" was thus invented.

During the same year, the ACM (Association of Computing Machinery) decided to adopt a professional code of ethics due to which, by the middle of the 1970s new privacy and computer crime laws had been put in place in United States as well as Europe.

In the year 1976 Joseph Weizenbaum made his second significant addition to the field of computer ethics. He published a book titled "Computer power and Human reason" which talked about how artificial intelligence is good for the world; however it should never be allowed to make the most important decisions as it does not have human qualities such as wisdom. By far the most important point he makes in the book is the distinction between choosing

and deciding. He argued that deciding is a computational activity while making choices is not and thus the ability to make choices is what makes us humans.

At a later time during the same year Abbe Mowshowitz, a professor of Computer Science at the City College of New York, published an article titled "On approaches to the study of social issues in computing". This article identified and analyzed technical and non-technical biases in research on social issues present in computing.

During 1978, the Right to Federal Privacy Act was adopted and this drastically limited the government's ability to search bank records.

During the same year Terrell Ward Bynum, the professor of Philosophy at Southern Connecticut State University as well as Director of the Research Center on Computing and Society there, developed the first ever curriculum for a university course on computer ethics. To make sure he kept the interests of students alive in computer ethics, he launched an essay contest where the subject students had to write about computer ethics. In 1985, he published a journal titled “Entitled Computers and Ethics”, which turned out to be his most famous publication to date.

In 1984, the Small Business Computer Security and Education act was adopted and this act basically informed the congress on matters that were related to computer crimes against small businesses.

In 1985, James Moor, Professor of Philosophy at DartMouth College in New Hampshire, published an essay called "What is Computer Ethics". In this essay Moor states the computer ethics includes the following: "(1) identification of computer-generated policy vacuums, (2) clarification of conceptual muddles, (3) formulation of policies for the use of computer technology, and (4) ethical justification of such policies."

During the same year, Deborah Johnson, Professor of Applied Ethics and Chair of the Department of Science, Technology, and Society in the School of Engineering and Applied Sciences of the University of Virginia, got the first major computer ethics textbook published. It didn't just become the standard setting textbook for computer ethics, but also set up the research agenda for the next 10 years.

In 1988, a librarian at St. Cloud University by the name of Robert Hauptman, came up with "information ethics", a term that was used to describe the storage, production, access and dissemination of information. Near the same time, the Computer Matching and Privacy Act was adopted and this act restricted the government to programs and identifying debtors.

The 1990s was the time when computers were reaching their pinnacle and the combination of computers with telecommunication, the internet, and other media meant that many new ethical issues were raised.

In the year 1992, ACM adopted a new set of ethical rules called "ACM code of Ethics and Professional Conduct" which consisted of 24 statements of personal responsibility.

3 years later in 1995, Gorniak Kocikowska, a Professor of Philosophy at Southern Connecticut State University, Coordinator of the Religious Studies Program, as well as a Senior Research Associate in the Research Center on Computing and Society, came up with the idea that computer ethics will eventually become a global ethical system and soon after, computer ethics would replace ethics altogether as it would become the standard ethics of the information age.

In 1999, Deborah Johnson revealed her view, which was quite contrary to Kocikowska's belief, and stated that computer ethics will not evolve but rather be our old ethics with a slight twist.

Computer Ethics

Ethics deals with placing a "**value**" on acts according to whether they are "**good**" or "**bad**". Every society has its rules about whether certain acts are ethical or not. These rules have been established as a result of consensus in society and are often written into laws.

When computers first began to be used in society at large, the absence of ethical standards about their use and related issues caused some problems. However, as their use became widespread in every facet of our lives, discussions in **computer ethics** resulted in some kind of a consensus. Today, many of these rules have been formulated as laws, either national or international. **Computer crimes** and **computer fraud** are now common terms. There are laws against them, and everyone is responsible for knowing what constitutes computer crime and computer fraud.

The **Ten Commandments of computer ethics** have been defined by the **Computer Ethics Institute**. Here is our interpretation of them:

1) Thou shalt not use a computer to harm other people: If it is unethical to harm people by making a bomb, for example, it is equally bad to write a program that handles the timing of the bomb. Or, to put it more simply, if it is bad to steal and destroy other people's books and notebooks, it is equally bad to access and destroy their files.

2) Thou shalt not interfere with other people's computer work: Computer **viruses** are small programs that disrupt other people's computer work by destroying their files, taking huge amounts of computer time or memory, or by simply displaying annoying messages. Generating and consciously spreading computer viruses is unethical.

3) Thou shalt not snoop around in other people's files: Reading other people's e-mail messages is as bad as opening and reading their letters: This is invading their privacy. Obtaining other people's non-public files should be judged the same way as breaking into their rooms and stealing their documents. Text documents on the Internet may be protected by **encryption**.

4) Thou shalt not use a computer to steal: Using a computer to break into the accounts of a company or a bank and transferring money should be judged the same way as robbery. It is illegal and there are strict laws against it.

5) Thou shalt not use a computer to bear false witness: The Internet can spread untruth as fast as it can spread truth. Putting out false "information" to the world is bad. For instance, spreading false rumors about a person or false propaganda about historical events is wrong.

6) Thou shalt not use or copy software for which you have not paid: Software is an intellectual product. In that way, it is like a book: Obtaining illegal copies of copyrighted software is as bad as photocopying a copyrighted book. There are laws against both. Information about the copyright owner can be embedded by a process called watermarking into pictures in the digital format.

7) Thou shalt not use other people's computer resources without authorization: Multiuser systems use **user id's** and **passwords** to enforce their memory and time allocations, and to safeguard information. You should not try to bypass this authorization system. **Hacking** a system to break and bypass the authorization is unethical.

8) Thou shalt not appropriate other people's intellectual output: For example, the programs you write for the projects assigned in this course are your own intellectual output. Copying somebody else's program without proper authorization is **software piracy** and is unethical. **Intellectual property** is a form of ownership, and may be protected by copyright laws.

9) Thou shalt think about the social consequences of the program you write: You have to think about computer issues in a more general social framework: Can the program you write be used in a way that is harmful to society? For example, if you are working for an animation house, and are producing animated films for children, you are

responsible for their contents. Do the animations include scenes that can be harmful to children? In the United States, the **Communications Decency Act** was an attempt by lawmakers to ban certain types of content from Internet websites to protect young children from harmful material. That law was struck down because it violated the free speech principles in that country's constitution. The discussion, of course, is going on.

10) Thou shalt use a computer in ways that show consideration and respect: Just like public buses or banks, people using computer communications systems may find themselves in situations where there is some form of queuing and you have to wait for your turn and generally be nice to other people in the environment. The fact that you cannot see the people you are interacting with does not mean that you can be rude to them.

Defining Computer Ethics

In 1976, nearly three decades after the publication of Wiener's book *Cybernetics*, Walter Maner noticed that the ethical questions and problems considered in his Medical Ethics course at Old Dominion University often became more complicated or significantly altered when computers got involved. Sometimes the addition of computers, it seemed to Maner, actually generated *wholly new ethics problems that would not have existed if computers had not been invented*. He concluded that there should be a new branch of applied ethics similar to already existing fields like medical ethics and business ethics; and he decided to name the proposed new field "computer ethics". (At that time, Maner did not know about the computer ethics works of Norbert Wiener.) He defined the proposed new field as one that studies ethical problems "aggravated, transformed or created by computer technology". He developed an experimental computer ethics course designed primarily for students in university-level computer science programs. His course was a success, and students at his university wanted him to teach it regularly. He complied with their wishes and also created, in 1978, a "starter kit" on teaching computer ethics, which he prepared for dissemination to attendees of workshops that he ran and speeches that he gave at philosophy conferences and computing science conferences in America. In 1980, Helvetia Press and the National Information and Resource Center on Teaching Philosophy published Maner's computer ethics "starter kit" as a monograph (Maner 1980). It contained curriculum materials and pedagogical advice for university teachers. It also included a rationale for offering such a course in a university, suggested course descriptions for university catalogs, a list of course objectives, teaching tips, and discussions of topics like privacy and confidentiality, computer crime, computer decisions, technological dependence and professional codes of ethics. During the early 1980s, Maner's *Starter Kit* was widely disseminated by Helvetia Press to colleges and universities in America and elsewhere. Meanwhile Maner continued to conduct workshops and teach courses in computer ethics. As a result, a number of scholars, especially philosophers and computer scientists, were introduced to computer ethics because of Maner's trailblazing efforts.

The "uniqueness debate"

While Maner was developing his new computer ethics course in the mid-to-late 1970s, a colleague of his in the Philosophy Department at Old Dominion University, Deborah Johnson, became interested in his proposed new field. She was especially interested in Maner's view that computers generate *wholly new* ethical problems, for she did not believe that this was true. As a result, Maner and Johnson began discussing ethics cases that allegedly involved *new* problems brought about by computers. In these discussions, Johnson granted that computers did indeed transform old ethics problems in interesting and important ways — that is, "give them a new twist" — but she did *not* agree that computers generated *ethically unique* problems that had never been seen before. The resulting Maner-Johnson discussion initiated a fruitful series of comments and publications on the nature and uniqueness of computer ethics — a series of scholarly exchanges that started with Maner and Johnson and later spread to other scholars. The following passage, from Maner's ETHICOMP95 keynote address, drew a number of other people into the discussion:

I have tried to show that there are issues and problems that are unique to computer ethics. For all of these issues, there was an essential involvement of computing technology. Except for this technology, these issues would not have arisen, or would not have arisen in their highly altered form. The failure to find satisfactory non-computer analogies testifies to the uniqueness of these issues. The lack of an adequate analogy, in turn, has interesting moral consequences. Normally, when we confront unfamiliar ethical problems, we use analogies to build conceptual bridges to similar situations we have encountered in the past. Then we try to transfer moral intuitions across the bridge, from the analog case to our current situation. Lack of an effective analogy forces us to discover new moral

values, formulate new moral principles, develop new policies, and find new ways to think about the issues presented to us. (Maner 1996, p. 152)

Over the decade that followed this provocative passage, the extended “uniqueness debate” led to a number of useful contributions to computer and information ethics. (For some example publications, see Johnson 1985, 1994, 1999, 2001; Maner 1980, 1996, 1999; Gorniak-Kocikowska 1996; Tavani 2002, 2005; Himma 2003; Floridi and Sanders 2004; Mather 2005; and Bynum 2006, 2007.)

DEVELOPMENT OF THE CASE STUDY

The challenge in presenting any 'non-technical' course content to engineering students is to make it relevant and engaging. This is especially true of a topic such as ethics, which can potentially viewed from a students' perspective as a highly theoretical exercise with limited relevance to the real world, or at the other extreme, challenging and confronting to the students' personal beliefs and ideals. It is within the context of wishing to ensure a macro-ethical approach as well as improving the engagement of undergraduate students in the learning process that the case study described in this paper was developed.

There exists no shortage of published resources and documented case studies dealing with professional ethics in the context of applying and interpreting relevant codes of ethics [4] [21], but the aim here was a macro- rather than micro-ethical approach. At the time I was searching for an actual occurrence that involved engineering, technology and moral decisions, there was a very public remembrance of the 50th anniversary of the use of the first atomic bomb. The development and use of the first atomic weapons is well documented and remains one of the greatest achievements of science and engineering in the technological sense. It is also one of the most controversial projects in terms of the moral justification of both the development phase and actual use of the weapons. Here then was the case study I was looking for.

THE CASE STUDY

Based on published accounts from a large number of sources, the case study documents, in the form of a time line, and objectively as possible, the scientific, social, political and military events spanning the discovery of the nuclear structure of atoms through to the use of atomic weapons against the Japanese in 1945. The time line format allows students to study the events leading up to the use of nuclear weapons in the correct temporal and causal sequence. Commencing the case study with the scientific discoveries that underpin nuclear power allows students to grasp the relationship between scientific research and the final application of technology. The following are selected segments of the case study time line.

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1911 - Ernest Rutherford publishes a paper describing the nuclear structure of atoms.

1917-1920 - Rutherford refines the nuclear model, and identifies the proton.

1932 - James Chadwick discovers the neutron and its ability to be absorbed by some atoms.

December, 1938 - Otto Hahn and Fritz Strassman solve the mystery of neutron absorption, a uranium nucleus can absorb a neutron and split into two smaller nuclei, and in the process release energy. This phenomenon is called nuclear fission. In fact the fission also produces more neutrons, which can split further uranium atoms, which produces more neutrons in an ever increasing release of energy called a chain reaction.

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December 7, 1941 - The Japanese attack Pearl Harbour, severely crippling the US Pacific fleet and killing more than 2300 people.

December 8, 1941 - The Americans declare war against Japan. Germany, Japan's ally, declares ware on America shortly thereafter. The US was now directly in the race to develop atomic weapons and devotes enormous resources to the project. Within six months they have outstripped the British effort and are motivated by the fear that the Germans are also working on atomic weapons. The US atomic weapons program is code-named the Manhattan Project.

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Summer, 1944 - The two basic bomb models are developed and partially tested on a small scale.

Late 1944 - The allied forces enter Germany, and a special US military scientific unit locate the chief German nuclear scientists and establish that the Germans have not developed a nuclear bomb. Several Manhattan scientists feel uneasy about continuing the project now that there is no German nuclear threat. But only one, Dr. Joseph Rotblat is known to have left. Oppenheimer described the project as now having a momentum of its own.

December 1944 - The allied offensive in Europe slows and the possibility of using an atomic bomb against Germany is discussed. The idea is dropped as the allied effort moved forward. The atomic bomb is now seen as a weapon to be used against the Japanese in the Pacific.

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8.15am, August 6, 1945 - The US B-29 bomber named the 'Enola Gay' drops a uranium little boy bomb on Hiroshima, killing approximately 130,000 people, of which only 20,000 are military personnel.

August 8, 1945 - The USSR declares war on Japan.

11.02am, August 9, 1945 - The US B-29 bomber names 'Bock's Car' drops a plutonium fat man bomb on Nagasaki, killing approximately 70,000 people, of which only 150 are military personnel.

August 10, 1945 - The Americans agree to allow the Japanese to retain their Emperor in surrender.

August 14, 1945 - The Japanese Emperor insists that Japan accept the Potsdam Declaration and the war in the Pacific comes to a close.

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Following the time line of events under consideration, a series of macro-ethical questions relating to the pursuit of knowledge, the application of technology, the roles and responsibilities of engineers in general, and particular questions arising from the case study are posed for consideration by students. Finally, an initial set of further references are offered to students who wish to read more widely. The following are selected ethical questions from the case study.

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Should the Manhattan project have been stopped after the defeat of the Germans?

Was it inevitable that the bombs would be used once they were successfully tested? Did those involved have to justify the money and effort expended in the development?

Would it have been better to demonstrate the destructive power of the bomb to the Japanese by allowing them to view a test explosion or dropping a bomb in an uninhabited area of Japan? Or was the 'shock value' of tens of thousands of deaths required to convince the Japanese?

Was it right to target Hiroshima and Nagasaki, which were primarily non-military cities?

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Some people have suggested that the devastation at Hiroshima and Nagasaki played an important part in stopping the use of nuclear weapons in wars since that time. Does this help to justify the use of atomic bombs on Japan?

What about the benefits of nuclear energy the world has derived from the work done on the Manhattan project?

Why wasn't work on atomic weapons development stopped after the defeat of the Japanese?

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The case study is presented to students in print form as an integral part of the normal course material they receive. The full text of the case study can be found on the World Wide Web at:

'http://www.deakin.edu.au/~spalm/ethics'.

APPLICATIONS AND LIMITATIONS OF THE CASE STUDY

The case study presents a context in which to introduce and discuss macro-ethical considerations for engineering students. This can be used to complement and balance a study program that examines micro-ethical issues, such as hypothetical situations involving moral choices for individual engineers, particularly those referring to the IEAust code of ethics. The case study is intended as a student resource that forms part of a complete ethics syllabus as outlined in Figure 1 above.

The case study was developed for use in engineering and technology undergraduate education, but the nature of the material lends itself to the teaching of science students as well, particularly those studying chemistry or physics. Used in the context of discussing the impacts of technology and ethical considerations in the link between research and development and the consequences of technology, the case study has wide applicability.

Even though the case study is based on events that occurred long before the birth of most of today's undergraduates, the history of the Manhattan project is still fascinating to anyone involved in science and technology, and the consequences of the development and use of nuclear power will continue to be relevant for the foreseeable future. The 50th anniversary of the use of nuclear weapons was quickly followed by French nuclear testing in the south pacific, the resumption of Chinese nuclear testing, the complications of the nuclear test ban treaty, and most recently renewed discussion about Australia's three uranium mine policy.

As a tool for provoking thought and moral debate, the case study achieved success even in the development phase, with different colleagues respectfully and variously suggesting that it presented in a bad light the Allies, the Japanese, the military, scientists and engineers.

The case study was developed to be used at first year undergraduate level, but the nature of the issues addressed in the case could be presented and discussed at any level. While no formal evaluation of the case study has yet been undertaken, students were given the opportunity to select the topic 'The ethics of the development and use of the atomic bomb in World War II', from a list of four topics relating to the course material, as the basis for their major semester essay. Of the students who elected to consider this topic, their concluding remarks ranged from unequivocal support for the use of atomic weapons by the Americans, to quoting the accounts of survivors from Hiroshima.

Even though every effort has been made to present the circumstances surrounding the development and use of nuclear weapons objectively, success in this area is necessarily limited by the availability and accuracy of the information sources used and the editing of those sources into a case study.

CONCLUSION

The members of the professions, including engineering, find themselves in a world of ever increasing ethical complexity, brought about by increasing social and commercial pressures, and by changes in the nature of the

professions themselves. To enable engineering graduates to deal effectively with these challenges we must ensure that, as students, they develop moral autonomy. To achieve this they must be exposed to a wide range of ethical issues including, the nature of ethics and moral decision making, and the relationship between science, engineering, technology and society, as well as the concept of professional ethics and the application of the code of ethics. The case study presented provides a context in which to introduce and discuss macro-ethical considerations for engineering students.

Discrimination

The aim of the Anti-Discrimination Act (the Act), and therefore the Anti-Discrimination Commission (ADC), is to promote recognition and acceptance of the right to equality of opportunity of persons regardless of an attribute to eliminate discrimination on the basis of an attribute and to eliminate sexual harassment.

These are pretty big aims and we work to achieve them through mechanisms such as our complaint handling, conciliation, public education and training services. http://www.nt.gov.au/justice/adc/aboutus.htm

When **handling a complaint of discrimination or other prohibited** conduct, the ADC will conduct an investigation and work with parties (ie the person making the complaint and the person/organisation about which the complaint is made) as they attempt to resolve the complaint through conciliation (link to definition of conciliation). When a complaint is not able to be resolved through conciliation, it may be determined through a public hearing. This hearing determines whether the actions alleged by the person making the complaint took place and if so, whether they amounted to unlawful conduct under the Act. As a general rule most of the complaints that we receive at the ADC are resolved without the need to go to hearing.

The ADC also provides public education and training, with a range of programs available to businesses, government, individuals and other organisations in the NT. These programs are designed to educate participants about what constitutes prohibited conduct under the Act and how it can be avoided. We also hold a number of public events during the year to promote the aims of the ADC.

Our other functions at the ADC include examining legislation to determine whether that legislation is consistent with the purposes of the Act; consulting with other organisations to work to improve services and conditions of those groups who may be subjected to prohibited conduct; advising the Minister on the operation of the Act; and providing other advice and assistance in relation to the Act.

The ADC has a key role in promoting equality of opportunity and eliminating discrimination in the Northern Territory, but we cannot do it alone. To have any success in achieving our aims, every Territorian will need to play a part. We all need to reflect on our own thoughts, and actions, and challenge discrimination where we see it.

One of the ways we can all do this is by considering our own prejudices. Treating others fairly means treating each person on their merits - not making assumptions about what a person can or cannot do, what that person thinks or how they will act just because they are female, or aboriginal, have a disability, are pregnant, or a parent. It means not hurting or making fun of others because of their race, their religion, their age, their sexuality or some other characteristic.

We also need to be clear about what we mean when we use the term "equality of opportunity". We are often asked whether this just means eliminating discrimination. Eliminating formal discrimination is a great aim, but it will not in itself ensure that we have equality of opportunity in the NT. Equality of opportunity is about ensuring that all members of our society have the opportunity to achieve to their full potential. For this to occur we all need to firstly recognise that there are groups in our community that are starting from a position of disadvantage, often as a result of a history of discrimination or other barriers to equality. To ensure that all members of society have equal access to opportunities such as education and work, some members will need some additional assistance to even get to the starting blocks.

This fact is recognised through the provisions in the Act that deal with "special measures" or positive discrimination designed to achieve equality; and those that provide for positive obligations such as accommodation of special need (link).

If you experience discrimination, or even just observe it, get in touch with us at the ADC. If you have a good story, or think an organisation or an individual deserves a pat on the back for their work to eliminate discrimination and promote equality of opportunity we would like to hear about that too.

Engineer as Expert Witness

An **expert witness**, **professional witness** or **judicial expert** is a witness, who by virtue of education, training, skill, or experience, is believed to have expertise and specialised knowledge in a particular subject beyond that of the average person, sufficient that others may officially and legally rely upon the witness's specialized (scientific, technical or other) opinion about an evidence or fact issue within the scope of his expertise, referred to as the expert opinion, as an assistance to the fact-finder.[1] Expert witnesses may also deliver **expert evidence** about facts from the domain of their expertise.[2] At times, their testimony may be rebutted with a learned treatise, sometimes to the detriment of their reputations.

Experts in the real world

Typically, experts are relied on for opinions on severity of injury, degree of insanity, cause of failure in a machine or other device, loss of earnings, care costs, and the like. In an intellectual property case, an expert may be shown two music scores, book texts, or circuit boards and asked to ascertain their degree of similarity. In the majority of cases the expert's personal relation to the defendant is considered irrelevant.

The tribunal itself, or the judge, can in some systems call upon experts to technically evaluate a certain fact or action, in order to provide the court with a complete knowledge on the fact/action it is judging. The expertise has the legal value of an acquisition of data. The results of these experts are then compared to those by the experts of the parties.

The expert has a heavy responsibility, especially in penal trials, and perjury by an expert is a severely punished crime in most countries. The use of expert witnesses is sometimes criticized in the United States because in civil trials, they are often used by both sides to advocate differing positions, and it is left up to a jury to decide which expert witness to believe. Although experts are legally prohibited from expressing their opinion of submitted evidence until after they are hired, sometimes a party can surmise beforehand, because of reputation or prior cases, that the testimony will be favorable regardless of any basis in the submitted data; such experts are commonly disparaged as "hired guns.

Duties of experts

In England and Wales, under the Civil Procedure Rules 1998 (CPR), an expert witness is required to be independent and address his or her expert report to the court. A witness may be jointly instructed by both sides if the parties agree to this, especially in cases where the liability is relatively small.

Under the CPR, expert witnesses are usually instructed to produce a joint statement detailing points of agreement and disagreement to assist the court or tribunal. The meeting is held quite independently of instructing lawyers, and often assists in resolution of a case, especially if the experts review and modify their opinions. When this happens, substantial trial costs can be saved when the parties to a dispute agree to a settlement. In most systems, the trial (or the procedure) can be suspended in order to allow the experts to study the case and produce their results. More frequently, meetings of experts occur before trial.

Experts charge a professional fee which is paid by the party commissioning the report (both parties for joint instructions) although the report is addressed to the court. The fee must not be contingent on the outcome of the

case. Expert witnesses may be subpoenaed (issued with a witness summons), although this is normally a formality to avoid court date clashes.

In the United States, under the Federal Rule of Evidence 702 (FRE), an expert witness must be qualified on the topic of testimony. In determining the qualifications of the expert, the FRE requires the expert have specialized education, training, or practical experience in the subject matter relating to the case.[6] The expert's testimony must be based on facts in evidence, and should offer opinion about the causation or correlation to the evidence in drawing a conclusion.

History

The earliest known use of an expert witness in English law came in 1782, when a court that was hearing litigation relating to the silting-up of Wells harbour in Norfolk accepted evidence from a leading civil engineer, John Smeaton. This decision by the court to accept Smeaton's evidence is widely cited as the root of modern rules on expert evidence. However, it was still such an unusual feature in court that in 1957 in the Old Bailey, Lord Justice Patrick Devlin could describe the case of suspected serial killer Dr John Bodkin Adams thus: "It is a most curious situation, perhaps unique in these courts, that the act of murder has to be proved by expert evidence."[7]

On the other hand, expert evidence is often the most important component of many civil and criminal cases today. Fingerprint examination, blood analysis and DNA fingerprinting are common kinds of expert evidence heard in serious criminal cases. In civil cases, the work of accident analysis, forensic engineers, and forensic accountants is usually important, the latter to assess damages and costs in long and complex cases. Intellectual property and medical negligence cases are typical examples.

Electronic evidence has also entered the courtroom as critical forensic evidence. Audio and video evidence must be authenticated by both parties in any litigation by a forensic expert who is also an expert witness who assists the court in understanding details about that electronic evidence.

Voice-mail recordings and closed-circuit television systems produce electronic evidence often used in litigation, more so today than in the past. Video recordings of bank robberies and audio recordings of life threats are presented in court rooms by electronic expert witnesses.

What is Moral Leadership?

Leadership is a complex concept, yet too often is it understood in narrow ways. Leaders are frequently considered to be those that have authority over others, those who control, those that somehow walk ahead, are better than the rest. This kind of leadership is often self-serving, short-term oriented and disempowers others. It has often proven disastrous on a personal and organizational level.

Moral Leadership is a very different kind of leadership. Rather than aspiring to being followed, Moral Leaders aim to serve. Instead of showcasing their own skills, Moral Leaders tend to develop the capacities of others. Moral Leadership is not about rank – any person holding any position can be a Moral Leader, but such individuals are always characterized by a deep sense of ethics, are driven by core ideals (such as justice) and are motivated by the pursuit of a higher purpose.

Moral Leadership is also about particular capacities and skills. First of all, Moral Leaders know how to manage themselves, how to temper their egos and how to act with nobility and rectitude. They are visionary and affect personal change. Moral Leaders also have a highly developed sense of emotional intelligence and master key social skills. They work to overcome obstacles and are skilled at the art of consultation. They build consensus navigate diversity and establish unity. Moral Leaders are the conscience (i.e. moral compass) of an enterprise or organization and the glue that holds it together.

Moral Leadership originates in, builds and reinforces Spiritual Capital.

For leaders to facilitate solutions to ethical dilemmas in the workplace, written guidelines in the form of a code of conduct are useful. According to Driscoll and Hoffman (2000), a code of conduct is intended to be a guide and reference for users in support of day-to-day decision making. It is meant to clarify an organization's mission, values and principles and to link them with standards of professional conduct. It can also serve as a reference used to locate resources related to ethics within the organization. While many organizations have noteworthy codes of ethics, the "Credo" of Johnson and

Johnson is often cited as a model example of a well written and highly effective one.

It is important that a code of ethics provide standards of behaviors, as opposed to a list of rules. The code of ethics should be based on organizational values, a philosophy of ethics, and the mission statement of the organization. Codes require the commitment of the company's leaders and other higher levels of management, and should address the needs of the various constituencies and stakeholders in the organization. For example, in a college athletic department, the Athletic Director and Associate/Assistant Athletic Directors would be considered, as would the coaches, student-athletes, boosters and fans, trainers, and staff. Similarly, for a school system such as that of Miami-Dade County, the fourth largest in the country, a code was developed and implemented for school employees (the superintendent, his assistants, school principals, and teachers), the students, and the outside vendors who do business with the schools. Though certain ethical considerations might apply to all, there are those that are specific to different constituencies.

CODE OF ETHICS

A code is an open disclosure for the way an organization operates. It provides visible guidelines for behavior. A well-written and thoughtful code also serves as an important communication vehicle that reflects the covenant that an organization has made to uphold its most important values, dealing with such matters as its commitment to employees, its standards for doing business and its relationship with the community (Driscoll & Hoffman). A code is also a tool to encourage discussions of ethics and to improve how employees/members deal with the ethical dilemmas, prejudices, and "gray areas" that are encountered in everyday work. A code is meant to complement relevant standards, policies, and rules, not to substitute for them. Codes of conduct offer an excellent opportunity for organizations to create a positive public identity for themselves which can lead to a more supportive political and regulatory environment and an increased level of public confidence and trust among important constituencies and stakeholders. Wherever possible, having employees participate in development of the organization's code of conduct is useful to create by-in and commitment. It is critical to include the top management and leadership in the code's development and implementation. It is also useful to define the enforcement capacity of a code of conduct, as frustration can be created when the code of conduct has no real "teeth" in terms of its punitive capabilities. Many times, however, when one is considering unethical behavior, having a set of published guidelines will serve as the necessary deterrent to prevent unethical acts.

Ultimately, the ideal solution for promoting ethical behavior is not a punitive one, but a positive approach by the leaders of organizations. Ethical behavior must be practiced by the leaders and modeled by those they lead. Ethical decision making should be acknowledged and rewarded. Ethics and leadership go hand in hand, and as Cuilla (1998), noted, ethics is the heart of leadership. We must return to that philosophy and make ethics a way of life.

ABET CODE OF ETHICS OF ENGINEERS

THE FUNDAMENTAL PRINCIPLES

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

I. using their knowledge and skill for the enhancement of human welfare;

II. being honest and impartial, and servicing with fidelity the public, their employers and clients;

III. striving to increase the competence and prestige of the engineering profession; and

IV. supporting the professional and technical societies of their disciplines.

THE FUNDAMENTAL CANONS

1. Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.

2. Engineers shall perform services only in the areas of their competence.

3. Engineers shall issue public statements only in an objective and truthful manner.

4. Engineers shall act in professional maters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.

5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.

6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity and dignity of the profession.

7. Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.

IEEE CODE OF ETHICS FOR ENGINEERS

PREAMBLE

Engineers affect the quality of life for all people in our complex technological society. In the pursuit of their profession, therefore, it is vital that engineers conduct their work in an ethical manner so that they merit the confidence of colleagues, employers, clients and the public. This IEEE Code of Ethics is a standard of professional conduct for engineers.

ARTICLE I

Engineers shall maintain high standards of diligence, creativity and productivity, and shall:

1. Accept responsibility for their actions;

2. Be honest and realistic in stating claims or estimates from available data;

3. Undertake engineering tasks and accept responsibility only if qualified by training or experience, or after full disclosure to their employers or clients of pertinent qualifications;

4. Maintain their professional skills at the level of the state of the art, and recognize the importance of current events in their work;

5. Advance the integrity and prestige of the engineering profession by practicing in a dignified manner and for adequate compensation.

ARTICLE II

Engineers shall, in their work:

1. Treat fairly all colleagues and coworkers, regardless of race, religion, sex, age or national origin;

2. Report, publish and disseminate freely information to others, subject to legal and proprietary restraints;

3. Encourage colleagues and co-workers to act in accord with this Code and support them when they do so;

4. Seek, accept and offer honest criticism of work, and properly credit the contributions of others;

5. Support and participate in the activities of their professional societies;

6. Assist colleagues and co-workers in their professional development.

ARTICLE III

Engineers shall, in their relations with employers and clients:

1. Act as faithful agents or trustees for their employers or clients in professional and business matters, provided such actions conform with other parts of this

Code;

2. Keep information on the business affairs or technical process of an employer or client in confidence while employed, and later, until such information is properly released, provided such actions conform with other parts of this Code;

3. Inform their employers, clients, professional societies or public agencies or private agencies of which they are members or to which they may make presentations, of any circumstance that could lead to a conflict of interest;

4. Neither give nor accept, directly or indirectly, any gift, payment or service of more than nominal value to or from those having business relationships with their employers or clients;

5. Assist and advise their employers or clients in anticipating the possible consequences, direct and indirect, immediate or remote, of the projects, work or plans of which they have knowledge.

ARTICLE IV

Engineers shall, in fulfilling their responsibilities to the community:

1. Protect the safety, health and welfare of the public and speak out against abuses in these areas affecting the public interest;

2. Contribute professional advice, as appropriate, to civic, charitable or other non-profit organizations;

3. Seek to extend public knowledge and appreciation of the engineering profession and its achievements

NSPE CODE OF ETHICS FOR ENGINEERS

Preamble

Engineering is an important and learned profession. As members of this profession, 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. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

I. Fundamental Canons

Engineers, in the fulfillment of their professional duties, shall:

1. Hold paramount the safety, health, and welfare of the public.

2. Perform services only in areas of their competence.

3. Issue public statements only in an objective and truthful manner.

4. Act for each employer or client as faithful agents or trustees.

5. Avoid deceptive acts.

6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness

II. Rules of Practice

1. Engineers shall hold paramount the safety, health, and welfare of the public.

a. If engineers' judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.

b. Engineers shall approve only those engineering documents that are in conformity with applicable standards.

c. Engineers shall not reveal facts, data, or information without the prior consent of the client or employer except as authorized or required by law or this Code.

d. Engineers shall not permit the use of their name or associate in business ventures with any person or firm that they believe is engaged in fraudulent or dishonest enterprise.

e. Engineers shall not aid or abet the unlawful practice of engineering by a person or firm.

f. Engineers having knowledge of any alleged violation of this Code shall report thereon to appropriate professional bodies and, when relevant, also to public authorities, and cooperate with the proper authorities in furnishing such information or assistance as may be required.

2. Engineers shall perform services only in the areas of their competence.

a. Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved.

b. Engineers shall not affix their signatures to any plans or documents dealing with subject matter in which they lack competence, nor to any plan or document not prepared under their direction and control.

c. Engineers may accept assignments and assume responsibility for coordination of an entire project and sign and seal the engineering documents for the entire project, provided that each technical segment is signed and sealed only by the qualified engineers who prepared the segment.

3. Engineers shall issue public statements only in an objective and truthful manner.

a. Engineers shall be objective and truthful in professional reports, statements, or testimony. They shall include all relevant and pertinent information in such reports, statements, or testimony, which should bear the date indicating when it was current.

b. Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence in the subject matter.

c. Engineers shall issue no statements, criticisms, or arguments on technical matters that are inspired or paid for by interested parties, unless they have prefaced their comments by explicitly identifying the interested parties on whose behalf they are matters.

4. Engineers shall act for each employer or client as faithful agents or trustees.

a. Engineers shall disclose all known or potential conflicts of interest that could influence or appear to influence their judgment or the quality of their services.

b. Engineers shall not accept compensation, financial or otherwise, from more than one party for services on the same project, or for services pertaining to the same project, unless the circumstances are fully disclosed and agreed to by all interested parties.

c. Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents in connection with the work for which they are responsible.

d. Engineers in public service as members, advisors, or employees of a governmental or quasi-governmental body or department shall not participate in decisions with respect to services solicited or provided by them or their organizations in private or public engineering practice.

e. Engineers shall not solicit or accept a contract from a governmental body on which a principal or officer of their organization serves as a member.

5. Engineers shall avoid deceptive acts.

a. Engineers shall not falsify their qualifications or permit misrepresentation of their or their associates' qualifications. They shall not misrepresent or exaggerate their responsibility in or for the subject matter of prior assignments. Brochures or other presentations incident to the solicitation of employment shall not misrepresent pertinent facts concerning employers, employees, associates, joint venturers, or past accomplishments.

b. Engineers shall not offer, give, solicit, or receive, either directly or indirectly, any contribution to influence the award of a contract by public authority, or which may be reasonably construed by the public as having the effect or intent of influencing the awarding of a contract. They shall not offer any gift or other valuable consideration in order to secure work. They shall not pay a commission, percentage, or brokerage fee in order to secure work, except to a bona fide employee or bona fide established commercial or marketing agencies retained by them.

III. Professional Obligations

1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.

a. Engineers shall acknowledge their errors and shall not distort or alter the facts.

b. Engineers shall advise their clients or employers when they believe a project will not be successful.

c. Engineers shall not accept outside employment to the detriment of their regular work or interest. Before accepting any outside engineering employment, they will notify their employers.

d. Engineers shall not attempt to attract an engineer from another employer by false or misleading pretenses.

e. Engineers shall not promote their own interest at the expense of the dignity and integrity of the profession.

2. Engineers shall at all times strive to serve the public interest.

a. Engineers are encouraged to participate in civic affairs; career guidance for youths; and work for the advancement of the safety, health, and well-being of their community.

b. Engineers shall not complete, sign, or seal plans and/or specifications that are not in standards. If the client or employer insists on such unprofessional conduct, they shall notify the proper authorities and withdraw from further service on the project.

c. Engineers are encouraged to extend public knowledge and appreciation of engineering and its achievements.

d. Engineers are encouraged to adhere to the principles of sustainable development1 in order to protect the environment for future generations.

3. Engineers shall avoid all conduct or practice that deceives the public.

a. Engineers shall avoid the use of statements containing a material misrepresentation of fact or omitting a material fact.

b. Consistent with the foregoing, engineers may advertise for recruitment of personnel.

c. Consistent with the foregoing, engineers may prepare articles for the lay or technical press, but such articles shall not imply credit to the author for work performed by others.

4. Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.

a. Engineers shall not, without the consent of all interested parties, promote or arrange for new employment or practice in connection with a specific project for which the engineer has gained particular and specialized knowledge.

b. Engineers shall not, without the consent of all interested parties, participate in or represent an adversary interest in connection with a specific project or proceeding in which the engineer has gained particular specialized knowledge on behalf of a former client or employer.

5. Engineers shall not be influenced in their professional duties by conflicting interests.

a. Engineers shall not accept financial or other considerations, including free engineering designs, from material or equipment suppliers for specifying their product.

b. Engineers shall not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with clients or employers of the engineer in connection with work for which the engineer is responsible.

6. Engineers shall not attempt to obtain employment or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods.

a. Engineers shall not request, propose, or accept a commission on a contingent basis under circumstances in which their judgment may be compromised.

b. Engineers in salaried positions shall accept part-time engineering work only to the extent consistent with policies of the employer and in accordance with ethical considerations.

c. Engineers shall not, without consent, use equipment, supplies, laboratory, or office facilities of an employer to carry on outside private practice.

7. Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or employment of other engineers. Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.

a. Engineers in private practice shall not review the work of another engineer for the same client, except with the knowledge of such engineer, or unless the connection of such engineer with the work has been terminated.

b. Engineers in governmental, industrial, or educational employ are entitled to review and evaluate the work of other engineers when so required by their employment duties.

c. Engineers in sales or industrial employ are entitled to make engineering comparisons of represented products with products of other suppliers.

8. Engineers shall accept personal responsibility for their professional activities, provided, however, that engineers may seek indemnification for services arising out of their practice for other than gross negligence, where the engineer's interests cannot otherwise be protected.

a. Engineers shall conform with state registration laws in the practice of engineering.

b. Engineers shall not use association with a non engineer, a corporation, or partnership as a "cloak" for unethical acts.

9. Engineers shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.

a. Engineers shall, whenever possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments.

b. Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be duplicated by the engineer for others without express permission.

c. Engineers, before undertaking work for others in connection with which the engineer may make improvements, plans, designs, inventions, or other records that may justify copyrights or patents, should enter into a positive agreement regarding ownership.

d. Engineers' designs, data, records, and notes referring exclusively to an employer's work are the employer's property. The employer should indemnify the engineer for use of the information for any purpose other than the original purpose.

e. Engineers shall continue their professional development throughout their careers and should keep current in their specialty fields by engaging in professional practice, participating in continuing education courses, reading in the technical literature, and attending professional meetings and seminars.

ASCE CODE OF ETHICS

Fundamental Principles

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

1. using their knowledge and skill for the enhancement of human welfare and the environment;

2. being honest and impartial and serving with fidelity the public, their employers and clients;

3. striving to increase the competence and prestige of the engineering profession; and

4. supporting the professional and technical societies of their disciplines.

Fundamental Canons

1. Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development3 in the performance of their professional duties.

2. Engineers shall perform services only in areas of their competence.

3. Engineers shall issue public statements only in an objective and truthful manner.

4. Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.

5. Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.

6. Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession and shall act with zero-tolerance for bribery, fraud, and corruption.

7. Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.

IEI CODE OF ETHICS

1.0 Preamble

1.1 The Corporate Members of The Institution of Engineers (India) are committed to promote and practice the profession of engineering for the common good of the community bearing in mind the following concerns:

1.1.1 Concern for ethical standard;

1.1.2 Concern for social justice, social order and human rights;

1.1.3 Concern for protection of the environment;

1.1.4 Concern for sustainable development;

1.1.5 Public safety and tranquility.

2.0 The Tenets of the Code of Ethics

2.1 A Corporate Member shall utilise his knowledge and expertise for the welfare, health and safety of the community without any discrimination for sectional or private interests.

2.2 A Corporate Member shall maintain the honour, integrity and dignity in all his professional actions to be worthy of the trust of the community and the profession.

2.3 A Corporate Member shall act only in the domains of his competence and with diligence, care, sincerity and honesty.

2.4 A Corporate Member shall apply his knowledge and expertise in the interest of his employer or the clients for whom he shall work without compromising with other obligations to these Tenets.

2.5 A Corporate Member shall not falsify or misrepresent his own or his associates' qualifications, experience, etc.

2.6 A Corporate Member, wherever necessary and relevant, shall take all reasonable steps to inform himself, his employer or clients, of the environmental, economic, social and other possible consequences, which may arise out of his actions.

2.7 A Corporate Member shall maintain utmost honesty and fairness in making statements or giving witness and shall do so on the basis of adequate knowledge.

2.8 A Corporate Member shall not directly or indirectly injure the professional reputation of another member.

2.9 A Corporate Member shall reject any kind of offer that may involve unfair practice or may cause avoidable damage to the ecosystem.

2.10 A Corporate Member shall be concerned about and shall act in the best of his abilities for maintenance of sustainability of the process of development.

2.11 A Corporate Member shall not act in any manner which may injure the reputation of the Institution.

UNIT - V

Global Issues and Responsibility as Engineer : Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Weapons Development, Role of Engineer as Manager – Expert Witnesses and Advisors - Case Studies .

Global Issues

‘A well intentioned engineer may still be a “bad” engineer if his work does not serve the public well’.

“Always do the right thing this will gratify some and astonish the rest”- Mark Twain

- **More and more companies expand their operations to include international work, the engineer’s professional life is bombarded with new considerations regarding the physical, cultural and political environments with which they must deal.**

The main body of law governing collective bargaining is the National Labor Relations Act (NLRA).
It explicitly grants employees the right to collectively bargain and join trade unions.
The NLRA was originally enacted by Congress in 1935 under its power to regulate interstate commerce.

GLOBALIZATION

- Globalization means integration of countries through commerce, transfer of technology, and exchange of information and culture.
- In a way, it includes acting together and interacting economies through trade, investment, loan, development schemes and capital across countries.
- In a different sense, these flows include knowledge, science, technology, skills, culture, information, and entertainment, besides direct human resource, tele-work, and outsourcing.
- This interdependence has increased the complex tensions and ruptures among the nations.
- For the engineers, the issues such as multinational organizations, computer, internet functions, military development and environmental ethics have assumed greater importance for their very sustenance and

MULTINATIONAL CORPORATIONS

- Organizations, who have established business in more than one country, are called Multinational Corporation. The headquarters are in the home country and the business is extended in many host countries.
- The Western organizations doing business in the less-economically developed (developing, and overpopulated) countries gain the advantage of inexpensive labor, availability of natural resources, conducive-tax atmosphere, and virgin market for the products.
- At the same time, the developing countries are also benefited by fresh job opportunities, jobs with higher remuneration and challenges, transfer of technology, and several social benefits by the wealth developed.
- But this happens invariably with some social and cultural disturbance. Loss of jobs for the home country, and loss or exploitation of natural resources, political instability for the host countries are some of the threats of glob

MNCs and Morality

- The economic and environmental conditions of the home and host countries may vary. But the multinational institutions have to adopt appropriate measures not to disturb or dislocate the social and living conditions and cultures of the home countries. A few principles are enlisted here:
- 1. MNC should respect the basic human rights of the people of the host countries.
- 2. The activities of the MNC should give economic and transfer technical benefits, and implement welfare measures of the workers of the host countries.
- 3. The business practices of the multinational organisations should improve and promote morally justified institutions in the host countries.
- 4. The multinationals must respect the laws and political set up, besides cultures and promote the cultures of the host countries.
- 5. The multinational organisations should provide a fair remuneration to the employees of the host countries. If the remuneration is high as that of home country, this may create tensions and if it is too low it will lead to exploitation.
- 6. Multinational institutions should provide necessary safety for the workers when they are engaged in hazardous activities and 'informed consent' should be obtained from them. Adequate compensation should be paid to them for the additional risks undertaken.

Case Study: Bhopal Gas Tragedy

BUSINESS ETHICS

Ethics is a set of rules that define right and wrong conduct.

Business ethics can be defined as written and unwritten codes of principles and values that govern decisions and actions within a company. In the business world, the organization's culture sets standards for determining the difference between good and bad decision making and behavior.

3 Models of Management Ethics

1. **Moral Management**—Conforms to high standards of ethical behavior.

2. **Immoral Management**—A style devoid of ethical principles and active opposition to what is ethical.

3. **Amoral Management**—
   - **Intentional - does not consider ethical factors**
   - **Unintentional - casual or careless about ethical considerations in business**

WHO IS RESPONSIBLE FOR CREATING ETHICS IN AN ORGANIZATION ?

A company's managers play an important role in establishing its ethical tone. If managers behave as if the only thing that matters is profit, employees are likely to act in a like manner. A company's leaders are responsible for setting standards for what is and is not acceptable employee behavior.

It's vital for managers to play an active role in creating a working environment where employees are encouraged and rewarded for acting in an ethical manner.

OTHER FACTORS IMPACTING ORGANIZATIONAL ETHICS

- Corporate culture
- Existence and application of a written code of ethics
- Formal and informal policies and rules
- Norms for acceptable behavior
- Financial reward system
- System for recognizing accomplishment
- Company attitude toward employees
- How employees are selected for promotions
- Hiring practices
- Applications of legal behavior
- Degree to which professionalism is emphasized
- The company's decision making processes
- Behaviors and attitudes of the organization's leaders

7 Principles of Admirable Business Ethics

- 1. Be Trustful
- 2. Keep An Open Mind
- 3. Meet Obligations
- 4. Have Clear Documents
- 5. Become Community Involved
- 6. Maintain Accounting Control
- 7. Be Respectful

Overview of issues in business ethics

- Corporate social responsibility
- fiduciary responsibility, stakeholder concept v. shareholder concept
- industrial espionage.

General business ethics

- Ethics of human resource management
- Ethics of sales and marketing
- Ethics of production
- Ethics of intellectual property, knowledge and skills

IMPORTANCE OF BUSINESS ETHICS

- ✓Public expects business to exhibit high levels of ethical performance and social responsibility.
- ✓Encouraging business firms and their employees to behave ethically is to prevent harm to society.
- ✓Promoting ethical behavior is to protect business from abuse by unethical employees or unethical competitors.
- ✓High ethical performance also protects the individuals who work in business.

ENVIRONMENTAL ETHICS

- Environmental ethics is the study of

(a) moral issues concerning the environment, and

(b) moral perspectives, beliefs, or attitudes concerning those issues.

- Engineers in the past are known for their negligence of environment, in their activities. It has become important now that engineers design eco-friendly tools, machines, sustainable products, processes, and projects.
- These are essential now to

(a)ensure protection (safety) of environment

(b)prevent the degradation of environment, and

(c)slow down the exploitation of the natural resources, so that the future generation can survive.

ENVIRONMENTAL ETHICS…

- The American Society of Civil Engineers (ASCE) code of ethics, has specifically requires that “engineers shall hold paramount the safety, health, and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of professional duties”
- The term sustainable development emphasizes on the investment, orientation of technology, development and functioning of organizations to meet the present needs of people and at the same time ensuring the future generations to meet their needs.
- Compaq Computer Corporation (now merged with HP) was the leader, who exhibited their commitment to environmental health, through implementation of the concept of ‘Design for environment’ on their products, unified standards all over the world units, and giving priority to vendors with a record of environmental concern.

ENVIRONMENTAL ETHICS…

- Engineers as experimenters have certain duties towards environmental ethics, namely:

1. Environmental impact assessment: One major but sure and unintended effect of technology is wastage and the resulting pollution of land, water, air and even space. Study how the industry and technology affects the environment.
2. Establish standards: Study and to fix the tolerable and actual pollution levels.
3. Counter measures: Study what the protective or eliminating measures are available for immediate implementation
4. Environmental awareness: Study on how to educate the people on environmental practices, issues, and possible remedies.

Disasters

- 1. Plastic Waste Disposal
- 2. e-Waste Disposal
- 3. Industrial Waste Disposal
- 4. Depletion of Ozone Layer
- 5. Global Warming
- 6. Acid Rain

1. Plastic Waste Disposal

- In our country, several crores of plastic bottles are used as containers for water and oil, and plastic bags are used to pack different materials ranging from vegetables to gold ornaments. Hardly any of these are recycled.
- They end up in gutters, roadsides, and agricultural fields. In all these destinations, they created havoc.
- The worse still is the burning of plastic materials in streets and camphor along with plastic cover in temples, since they release toxic fumes and threaten seriously the air quality.
- Cities and local administration have to act on this, collect and arrange for recycling through industries.

2. e-Waste Disposal

- The parts of computers and electronic devices which have served its useful life present a major environmental issue for all the developing countries including India. This scrap contains highly toxic elements such as lead, cadmium, and mercury.
- Even the radioactive waste will lose 89% of its toxicity after 200 years, by which time it will be no more toxic than some natural minerals in the ground.
- It will lose 99% of its remaining toxicity over the next 30,000 years. The toxic chemical agents such as mercury, arsenic, and cadmium retain toxicity undiminished forever. But these scraps are illegally imported by unscrupulous agencies to salvage some commercially valuable inputs.
- Instead of spending and managing on the scrap, unethical organizations sell them to countries such as India. This is strictly in violation of the Basel Convention of the United Nations Environment Program, which has banned

2. e-Waste Disposal…

- A recent report of the British Environment Agency has revealed that the discarded computers, television sets, refrigerators, mobile phones, and electrical equipments have been dispatched to India and Pakistan in large quantity, for ultimate disposal in environmentally-unacceptable ways and at great risk to the health of the labour.
- Even in the West, the electronic junk has been posing problems. Strong regulation including (a) pressure on industries to set up disassembling facilities,
- (b) ban on disposal in landfill sites,
- (c) legislation for recycling requirements for these junk and
- (d) policy incentives for eco-friendly design are essential for every country.
- Every country needs regulations to define waste, measures to stop illegal imports, and institutional structures to handle safe disposal of domestic industrial scrap.

3. Industrial Waste Disposal

- There has been a lot of complaints through the media, on
- (a) against the Sterlite Copper Smelting Plant in Thuthukkudi (1997) against its pollution, and
- (b) when Indian companies imported the discarded French Warship Clemenceau for disposal, the poisonous asbestos compounds were expected to pollute the atmosphere besides exposing the labor to a great risk, during the disposal.
- The government did not act immediately.
- Fortunately for Indians, the French Government intervened and withdrew the ship, and the serious threat was averted!

4. Depletion of Ozone Layer

- The ozone layer protects the entire planet from the ill-effects of ultraviolet radiation and is vital for all living organisms in this world.
- But it is eaten away by the Chloro-fluro-carbons (CFC) such as Freon emanating from the refrigerators, air conditioners, and aerosol can spray.
- This has caused also skin cancer to sun-bathers in the Western countries. Further NO and NO2 gases were also found to react with the ozone.
- Apart from engineers, the organizations, laws of the country and local administration and market mechanisms are required to take up concerted efforts to protect the environment.

5. Global Warming

- Over the past 30 years, the Earth has warmed by 0.6 °C. Over the last 100 years, it has warmed by 0.8 °C. It is likely to push up temperature by 3 oC by 2100, according to NASA's studies.
- The U.S. administration has accepted the reality of global climate change, which has been associated with stronger hurricanes, severe droughts, intense heat waves and the melting of polar ice.
- Greenhouse gases, notably carbon dioxide emitted by motor vehicles and coal-fired power plants, trap heat like the glass walls of a greenhouse, cause the Earth to warm up.
- Delegates from the six countries — Australia, China, India, Japan, South Korea and US met in California in April 2006 for the first working session of the Asia- Pacific Partnership on Clean Development and Climate.
- These six countries account for about half of the world's emissions of climate-heating greenhouse gases.

6. Acid Rain

- Large emissions of sulphur oxides and nitrous oxides are being released in to the air from the thermal power stations using the fossil fuels, and several processing industries.
- These gases form compounds with water in the air and precipitates as rain or snow on to the earth.
- The acid rain in some parts of the world has caused sufficient damage to the fertility of the land and to the human beings.

Human-centered Environmental Ethics

- This approach assumes that only human beings have inherent moral worth duly to be taken care of.
- Other living being and ecosystems are only instrumental in nature. Utilitarianism aims to maximize good consequences for human beings. Most of the goods are engineered products made out of natural resources.
- Human beings have also (a) recreational interests (enjoy leisure through mountaineering, sports, and pastimes), (b) aesthetic interests (enjoy nature as from seeing waterfalls and snow-clad mountains), (c) scientific interests to explore into nature or processes, and (d) a basic interest to survive, by preservation as well as conservation of nature and natural resources.
- Rights ethicists favor the basic rights to live and right to liberty, to realise the right to a live in a supportive environment.

5.2.2 Human-centered Environmental Ethics…

- Further, virtue ethics stresses importance of prudence, humility, appreciation of natural beauty, and gratitude to the mother nature that provides everything.
- However, the nature-centered ethics, which ensures the worth of all living beings and organisms, seems to be more appropriate in the present-day context.
- Many Asian religions stress the unity with nature, rather than domination and exploitation.
- The Zen Buddhism calls for a simple life with compassion towards humans and other animals.
- Hinduism enshrines the ideal of oneness (advaitha) in and principle of ahimsa to all living beings. It identifies all the human beings, animals, and plants a s d j
- The eco-balance is the need of the hour and the engineers are the right

Dr Gr ar æ ka

Computer Ethics

The **Ten Commandments of computer ethics** have been defined by the **Computer Ethics Institute:**

1) **Thou shalt not use a computer to harm other people**
2) **Thou shalt not interfere with other people's computer work**
3) **Thou shalt not snoop around in other people's files**
4) **Thou shalt not use a computer to steal**
5) **Thou shalt not use a computer to bear false witness**
6) **Thou shalt not use or copy software for which you have not paid**
7) **Thou shalt not use other people's computer resources without authorization**
8) **Thou shalt not appropriate other people's intellectual output**
9) **Thou shalt think about the social consequences of the program you write**
10) **Thou shalt use a computer in ways that show consideration and respect**

COMPUTER ETHICS

- Computer ethics is defined as

(a) study and analysis of nature and social impact of computer technology,

(b) formulation and justification of policies, for ethical use of computers.

- This subject has become relevant to the professionals such as designers of computers, programmers, system analysts, system managers, and operators.
- The use of computers have raised a host of moral concerns such as free speech, privacy, intellectual property right, and physical as well as mental harm.
- There appears to be no conceptual framework available on ethics, to study and understand and resolve the problems in computer technology.

Types of Issues

Different types of problems are found in computer ethics.

1. Computer as the Instrument of Unethical Acts
2. Computer as the Object of Unethical Act
3. Problems Related to the Autonomous Nature of Computer

1. Computer as the Instrument of Unethical Acts

(a) The usage of computer replaces the job positions. This has been overcome to a large extent by readjusting work assignments, and training everyone on computer applications such as word processing, editing, and graphics.

(b) Breaking privacy. Information or data of the individuals accessed or erased or the ownership changed.

(c) Defraud a bank or a client, by accessing and withdrawing money from other's bank account.

2. Computer as the Object of Unethical Act

- The data are accessed and deleted or changed.
- (a) Hacking: The software is stolen or information is accessed from other computers. This may cause financial loss to the business or violation of privacy rights of the individuals or business. In case of defense information being hacked, this may endanger the security of the nation.
- (b) Spreading virus: Through mail or otherwise, other computers are accessed and the files are erased or contents changed altogether. ‘Trojan horses’ are implanted to distort the messages and files beyond recovery. This again causes financial loss or mental torture to the individuals. Some hackers feel that they have justified their right of free information or they do it for fun. However, these acts are certainly unethical.
- (c) Health hazard: The computers pose threat during their use as well as during disposal.

3. Problems Related to the Autonomous Nature of Computer

(a) Security risk: Recently the Tokyo Stock Exchange faced a major embarrassment. A seemingly casual mistake by a junior trader of a large security house led to huge losses including that of reputation. The order through the exchange's trading system was to sell one share for 600,000 Yen. Instead the trader keyed in a sale order for 600,000 shares at the rate of one Yen each. Naturally the shares on offer at the ridiculously low price were lapped up. And only a few buyers agreed to reverse the deal! The loss to the securities firm was said to be huge, running into several hundred thousands. More important to note, such an obvious mistake could not be corrected by some of the advanced technology available. For advanced countries like Japan who have imbibed the latest technology, this would be a new kind of learning experience.12

(b) Loss of human lives: Risk and loss of human lives lost by computer, in the operational control of military weapons. There is a dangerous instability in automated defense system. An unexpected error in the software or hardware or a conflict during interfacing between the two, may trigger a serious attack and cause irreparable human loss before the error is traced. The Chinese embassy was bombed by U.S. military in Iraq a few years back, but enquiries revealed that the building was shown in a previous map as the building where insurgents stayed.

(c) In flexible manufacturing systems, the autonomous computer is beneficial in obtaining

Computers In Workplace

The ethical problems initiated by computers in the workplace are:

- 1. Elimination of routine and manual jobs. This leads to unemployment, but the creation of skilled and IT-enabled service jobs are more advantageous for the people.
- 2. Health and safety: The ill-effects due to electromagnetic radiation, especially on women and pregnant employees, mental stress, wrist problem known as Carpel Tunnel Syndrome, and back pain due to poor ergonomic seating designs, and eye strain due to poor lighting and flickers in the display and long exposure, have been reported worldwide.
- 3. Computer failure: Failure in computers may be due to errors in the hardware or software. Hardware errors are rare and they can be solved easily and quickly. But software errors are very serious as they

Property Issues

The property issues concerned with the computers are:

1. Computers have been used to extort money through anonymous telephone calls.
2. Computers are used to cheat and steal by current as well as previous employees.
3. Cheating of and stealing from the customers and clients.
4. Violation of contracts on computer sales and services.
5. Conspiracy as a group, especially with the internet, to defraud the gullible, stealing the identity and to forge documents.
6. Violation of property rights: Is the software a property? The software could be either a Program (an algorithm, indicating the steps in solving a problem) or a Source code (the algorithm in a general computer language such as FORTAN, C and COBOL or an Object code (to translate the source code into the machine language). How do we apply the concept of property here? This demands a framework for ethical judgments.

Computer Crime

The ethical features involved in computer crime are:

1. Physical Security

The computers are to be protected against theft, fire, and physical damage. This can be achieved by proper insurance on the assets.

2. Logical security

The aspects related are (a) the privacy of the individuals or organizations, (b) confidentiality, (c) integrity, to ensure that the modification of data or program are done only by the authorized persons, (d) uninterrupted service. This is achieved by installing appropriate uninterrupted power supply or back-up provisions, and (e) protection against hacking that causes dislocation or distortion.

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Computer Crime….

Major weaknesses in this direction are:

(a) the difficulty in tracing the evidence involved and

(b) absence of stringent punishment against the crime.

- The origin of a threat to the Central Government posted from an obscure browsing center, remained unsolved for quite a long time.
- Many times, such crimes have been traced, but there are no clear cyber laws to punish and deter the criminals.

WEAPONS DEVELOPMENT

- Military activities including the world wars have stimulated the growth of technology. The growth of Internet amply illustrates this fact.
- Engineers involve in weapons development because of the following reasons:

1. It gives one job with high salary.
2. One takes pride and honor in participating in the activities towards the defense of the nation (patriotic fervor).
3. One believes the he fights a war on terrorism and thereby contribute to peace and stability of the country. Ironically, the wars have never won peace, only peace can win peace!
4. By research and development, the engineer is reducing or eliminating the risk from enemy weapons, and saving one's country from disaster.
5. By building-up arsenals and show of force, a country can force the rogue country, towards regulation.

ENGINEERS AS MANAGERS

Characteristics

- The characteristics of engineers as managers are:
- 1. Promote an ethical climate, through framing organization policies, responsibilities and by personal attitudes and obligations.
- 2. Resolving conflicts, by evolving priority, developing mutual understanding, generating various alternative solutions to problems.
- 3. Social responsibility to stakeholders, customers and employers. They act to develop wealth as well as the welfare of the society.

Managing Conflicts

In solving conflicts, force should not be resorted. In fact, the conflict situations should be tolerated, understood, and resolved by participation by all the concerned. The conflicts in case of project managers arise in the following manners:

(a)Conflicts based on schedules: This happens because of various levels of execution, priority and limitations of each level.

(b)Conflicts arising out of fixing the priority to different projects or departments. This is to be arrived at from the end requirements and it may change from time to time.

(c) Conflict based on the availability of personnel.

(d)Conflict over technical, economic, and time factors such as cost, time, and performance level.

(e) Conflict arising in administration such as authority, responsibility, accountability, and logistics required.

(f) Conflicts of personality, human psychology and ego problems.

(g)Conflict over expenditure and its deviations.

Most of the conflicts can be resolved by following the principles listed here:

Managing Conflicts……

1. People

Separate people from the problem. It implies that the views of all concerned should be obtained. The questions such as what, why, and when the error was committed is more important than to know who committed it. This impersonal approach will lead to not only early solution but also others will be prevented from committing errors.

2. Interests

Focus must be only on interest i.e., the ethical attitudes or motives and not on the positions (i.e., stated views). A supplier may require commission larger than usual prevailing rate for an agricultural product. But the past analysis may tell us that the material is not cultivated regularly and the monsoon poses some additional risk towards the supply. Mutual interests must be respected to a maximum level. What is right is more important than who is right!

Managing Conflicts……

3. Options

Generate various options as solutions to the problem. This helps a manager to try the next best solution should the first one fails. Decision on alternate solutions can be taken more easily and without loss of time.

4. Evaluation

The evaluation of the results should be based on some specified objectives such as efficiency, quality, and customer satisfaction. More important is that the means, not only the goals, should be ethical.

ENGINEERS AS EXPERT WITNESS

- Frequently engineers are required to act as consultants and provide expert opinion and views in many legal cases of the past events.
- They are required to explain the causes of accidents, malfunctions and other technological behavior of structures, machines, and instruments, e.g., personal injury while using an instrument, defective product, traffic accident, structure or building collapse, and damage to the property, are some of the cases where testimonies are needed.
- The engineers, who act as expert-witnesses, are likely to abuse their positions in the following manners:

ENGINEERS AS EXPERT WITNESS....

1. Hired Guns

- Mostly lawyers hire engineers to serve the interest of their clients. Lawyers are permitted and required to project the case in a way favorable to their clients. But the engineers have obligations to thoroughly examine the events and demonstrate their professional integrity to testify only the truth in the court. They do not serve the clients of the lawyers directly. The hired guns forward white lies and distortions, as demanded by the lawyers. They even withhold the information or shade the fact, to favor their clients.

2. Money Bias

- Consultants may be influenced or prejudiced for monitory considerations, gain reputation and make a fortune.

ENGINEERS AS EXPERT WITNESS….

3. Ego Bias

The assumption that the own side is innocent and the other side is guilty, is responsible for this behavior. An inordinate desire to serve one's client and get name and fame is another reason for this bias.

4. Sympathy Bias

Sympathy for the victim on the opposite side may upset the testimony. The integrity of the consultants will keep these biases away from the justice. The court also must obtain the balanced view of both sides, by examining the expert witnesses of lawyers on both sides, to remove a probable bias.

ENGINEERS AS EXPERT WITNESS….

Duties

1. The expert-witness is required to exhibit the responsibility of confidentiality just as they do in the consulting roles. They can not divulge the findings of the investigation to the opposite side, unless it is required by the court of law.
2. More important is that as witness they are not required to volunteer evidence favorable to the opponent. They must answer questions truthfully, need not elaborate, and remain neutral until the details are asked for further.
3. They should be objective to discover the truth and communicate them honestly.
4. The stand of the experts depends on the shared understanding created within the society. The legal system should be respected and at the same time, they should act in conformance with the professional standards as obtained from the code of ethics.
5. The experts should earnestly be impartial in identifying and interpreting the observed data, recorde d data, and the industrial standards. They should no t distort the truth, even under pressure.