



Online Ethics Center
FOR ENGINEERING AND SCIENCE

Responsibility of Engineering: Codes and Professionalism

Author(s)

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Description

This activity is considered an NAE Exemplar in Engineering Ethics Education and was included in a 2016 [report](#) with other exemplary activities. This activity is a complete, graduate-level, 3-hour university course on engineering ethics. I created it about 15 years ago and have been teaching it continuously ever since. The focus is on the engineer as an individual designer, consultant, inspector, contractor, vendor, and/or government employee.

Body

Exemplary features:

Leverages student work experiences; interaction with practicing engineers

Why it's exemplary:

Students in this 3-hour graduate course gain valuable insight into engineering ethics through numerous lectures and assignments. Some key assignments call for conducting a formal interview of engineers about ethical challenges they have

faced, creating a two-hour engineering ethics workshop, and authoring a personal engineering code of ethics. Students who are practicing engineers, as well as beginning full-time graduate students, have found the formal interview very helpful. The students also have to create a workshop for their peers, with roundtable activities. For the engineering codes of ethics, which students create at the end of the semester, students gain ideas from professional societies' codes of ethics and then write a code of ethics that encompasses aspects that are vitally important to how they desire to live as an engineer.

Program description:

This activity is a complete, graduate-level, 3-hour university course on engineering ethics. I created it about 15 years ago and have been teaching it continuously ever since. The focus is on the engineer as an individual designer, consultant, inspector, contractor, vendor, and/or government employee. Most of the multiple hundreds of students who take this course are practicing engineers with a few years of experience; some have more than 10 years' experience. They mostly have backgrounds in civil engineering, electrical engineering, computer engineering, industrial engineering, and engineering management. Most students have had some formal exposure to engineering ethics—in a seminar-type course, as part of a day's discussion in a technical design course, during a few sessions in a senior project course, or through a lunch discussion hosted by a local chapter of engineers.

This CE 703 course is an intense study exclusively focused on the ethical responsibilities of being an engineer. The practicing engineers who take it have encountered ethical dilemmas and can highly relate to the subject matter of the course. Their practical experience maximizes the learning potential of the course. One of the assignments is for students to analyze an ethical dilemma they faced or were aware of. The complexity of the situations described is vast and difficult with no easy way to solve the ethical dilemmas. Some example situations are a politically appointed leader repeatedly overrules a county engineer over the closure of a highly dangerous bridge (i.e., most wooden piers completely rotted through); a company placing so much emphasis on its stellar safety record that accidents are not reported so hazards in a work environment go unaddressed (i.e., no one wants to be "that person" who breaks the record of accident-free days; a bribe is demanded of an engineer in return for a good inspection while working in a foreign environment (i.e.,

the project may die without a good inspection); engineers are asked to design a public facility with inadequate funds (i.e., facility can't be safely built with the resources available); engineers are pressured to adjust a technical report to decrease anticipated negative effects on the environment; and engineers are pressured to keep quiet after determining that poor record keeping by governmental utilities caused a client's underpayment for utility services by millions of dollars. The undergraduates who take this course have limited practical experience to build on so this course presents a lot of new aspects that they have not thought of before. These examples illustrate the need for engineering ethics education. The students who faced these dilemmas stated how incredibly valuable CE 703 Responsibility of Engineering: Codes & Professionalism was to them.

Key goal:

Increase abilities to make solid ethical decisions. Engineers need to approach ethical dilemmas using their strengths, similar to how they approach technical problems. Sometimes engineers give in to unethical solutions proposed by others because they think it's a nontechnical problem so others are better prepared to handle the issue. This course provides students new knowledge and the awareness of different engineering ethical concepts and approaches (i.e., character based, principle based, consequence based) to be used when facing ethical dilemmas. The NSPE and other codes of ethics are studied in detail. Students gain considerable confidence in their abilities to make highly ethical decisions by the end of the course. I don't expect this course alone to change an "unethical" engineer into one with high standards. I also don't take credit for the high ethical standards most engineers have that take this course. The students are interested in engineering ethics and enroll in a graduate-level engineering ethics course, indicating that they have a high level of appreciation for this topic already. I also understand that students who complete this course may make unethical decisions: they may succumb to the intense pressure of lack of time, peer pressure to make a bad decision, a supervisor requiring an unethical decision, the pursuit of profit, an unethical team culture, or the pursuit of being famous. I do expect students who complete CE 703 Responsibility of Engineering: Codes & Professionalism to be better able to understand which alternatives are ethically acceptable and which are not, champion ethical solutions when part of a team faced with an ethical dilemma, and generally conduct themselves as a professional with high standards.

Assessment information:

Formal and informal feedback from students has clearly indicated how much students have valued CE 703 Responsibility of Engineering: Codes & Professionalism. The following feedback has been documented in assessments: “Great teacher, great course.” “The instructor for this course is excellent. The primary purpose for taking this course was twofold; I had this instructor in a previous leadership and diversity class, which I found to be an excellent leadership experience, and secondly I wanted to learn more about improving my awareness of ethics and leadership skills. This course was one of the best learning experiences that I have had since returning to college to obtain my graduate degree. I wish that I had been taught this subject material years ago—it would have made my transition to management a lot smoother.” “The class was really useful for me, it is a subject that engineers do not pay any attention to. Everyone thinks that the classes that matter are the ones that are heavy on the mathematical side and all, but we need more classes like this one so we can become a better engineer and a better person.”

Some informal (email or verbal communication) feedback has been: “This is the most important course I have ever taken.” “Every engineering student should be required to take this engineering ethics course.” “This course has changed my life, I am much better prepared to make solid ethical decisions when faced with dilemmas.” “After completing this course I’m much better prepared to mentor the engineers that report to me.” The IDEA Center course evaluation process was used to formally assess this course. Four sections when the full IDEA diagnostic form was used are reported here (2012–2015). The IDEA Short Form was also periodically used, so the assessment results were not combined between the two different assessment methods. Students were asked to rate the question of “excellent course” on a scale of 1 to 5; a rating of 4 or 5 indicates the students rated the course as excellent. The average rating over the last four years was 4.2. Progress on the essential learning objective of “developing a clearer understanding of, and commitment to, personal values” was also assessed; students on average rated their progress on this objective as substantial or exceptional. This high level of progress ranked the course on this specific learning objective nationally in the top 10% of all engineering courses that used the IDEA Center assessment tools (a converted average score of 65; a score higher than 62 places the result in the highest comparison category). I have taught university courses for 21 years. I am not aware of a single other engineering ethics 3-hour course taught online at the

graduate level for practicing engineers. The continual, positive feedback I get from current and past CE 703 students communicates the important knowledge that students receive from taking the course.

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Resource Type

Educational Activity Description

Parent Collection

NAE Exemplars in Engineering Ethics Education

Topics

Pedagogical Approaches

Discipline(s)

Engineering

Teaching Ethics in STEM