
Michael J. Rabins,
Director, Engineering Ethics & Professionalism Program, Texas A&M University, USA

Keywords: engineering, ethics, teaching, professionalism, undergraduate, curriculum

ABSTRACT: The teaching of engineering ethics is on the increase at universities around the United States. The motivation for this increase (WHY?) has several driving forces, including: a new Accreditation Board for Engineering and Technology (ABET) accreditation criteria; new questions on Professional Engineering (PE) licensing examinations; new industrial marketplace needs; and a growing awareness in the engineering profession of a need for ethical sensitivity to the consequences of our actions as engineers.

The subject (WHAT?) is likely to be taught quite differently at each school, depending upon who is teaching it, in which department, and to which audience. The approach may range from applied ethical moral theory to case-based engineering consequences; with many different mixes within these two extremes. Common features for all approaches are the generic kinds of problems dealt with and the kinds of cases utilized.

Finally, the overall approach (HOW?) is perhaps as varied as the number of schools now teaching the subject. Some observers now estimate this number to be between 10 and 20 percent of all engineering schools. Again, the approaches range from stand-alone courses, elective or required, to segments in other courses whether at the introductory freshman or capstone design senior level. Some schools are adopting the pervasive approach of inserting small ethics segments into all or most of the required engineering courses.

This paper explores some details of the WHY?, WHAT?, and HOW?, and presents several examples of the various approaches cited above. It ends with a brief description of a stand-alone, upper division, three credit course now required of all engineering majors (about 600-700 per semester) at Texas A&M University.

* An earlier version of this paper was presented at the Engineering Foundation Conference on “Ethics for Science and Engineering Based International Industries”, Durham, NC, USA, 14-17 September 1997.

Address for correspondence: Professor Michael J. Rabins, Texas A & M University, Mechanical Engineering Department, College Station, TX 77843-3123, USA.

M. J. Rabins

WHY?

Perhaps one of the most compelling sets of motivations for teaching engineering ethics comes out of the five goals emerging from a Hasting Center study.\(^1\) The study was an outgrowth of an earlier conference on the subject funded by the National Science Foundation (NSF) and held at Rensselaer Polytechnic Institute in the late 1970s. The statement of these goals was in response to the question, "Why teach ethics to engineers?" The goals are:

- *Stimulate the ethical imagination of engineers.*
- *Help engineers to recognize ethical issues.*
- *Help engineers to analyze key ethical concepts and principles relevant to engineering practice.*
- *Help engineers deal with disagreement, ambiguity, and vagueness (there is no single correct answer to most ethical cases).*
- *Encourage engineers to take ethical responsibility seriously.*

These five goals get to the root needs for engineers to deal more effectively and sensitively with the consequences of their actions as engineers. Put succinctly, they address the widespread ambition of engineers to make a difference in what they do rather than just to make a living. In addition, engineers are becoming more concerned with the liabilities associated with their actions. Finally, there is a growing awareness that the immediate concern for a company's bottom line profits may be outweighed by the long-term needs for reputation, profitable viability, and continuity of a company's service to the public.

A pragmatic driving force for most academic administrators to encourage teaching of engineering ethics is the new ABET "Criterion 2000". These already approved criteria will go into effect in the year 2001 and emphasize "program outcomes and assessments" rather than credits taught in each subject or discipline.

The key criteria that deal with the issue of teaching engineering ethics are included in ABET criteria numbers 3 and 4 presented in Figure 1 (opposite). The two places in these criteria that address engineering ethics have been boldfaced in the figure.

Another pragmatic driving force for introducing engineering ethic issues into the classroom is the appearance within the past two years of ethics questions in the National Council of Examinations for Engineers and Surveyors (NCEES) part I examination for the professional engineering (PE) license. All 50 states and all territories in the U.S. use these examinations in administering professional engineering licensing procedures. The ethics multiple choice questions amount to about 5 percent of the examination and are based on the NCEES Rules of Conduct. The latter closely parallel most professional society codes of ethics. Review sessions that students now take to prepare for the professional engineering license examination regularly include sections on engineering ethics.