

# Chapter 11

## Teaching Engineering Ethics in the Classroom: Issues and Challenges

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### ABSTRACT

*Engineering students are introduced to their profession's ethical and social responsibilities along with their education and training at university. This might be the only time and place where public welfare engagement may be promoted by the institution and acknowledged by students. Their future behavior as engineers heavily depends on the understanding and commitment they may develop during this process. The purpose of this chapter is to discuss the main points related to the teaching and learning of Engineering Ethics at universities. In order to gain insight into this complex educational scene, a set of questions are formulated and explored. The discussion of these questions amounts to explain what Engineering Education consists of, how to integrate Engineering Ethics courses into the curriculum and develop instructional designs for classroom teaching, who should assume teaching responsibilities, and finally, what Engineering Ethics goals should be. For each query, the primal issues, controversies, and alternatives are discussed.*

### INTRODUCTION

*The bottom line is that the things engineers do have consequences, both positive and negative, sometimes unintended, often widespread, and occasionally irreversible. (Augustine, 2002, p.6).*

Today, Engineering Ethics (EE) is a subject included in many engineering curricula. The extension, the contents, the final goals, and the pedagogical

approach to this subject still remain as open questions, but its importance in the education of the future engineers seems to be growing day by day (Rabins, 1998). For instance, the Criterion 3 (Student Outcomes) of the ABET 2010-2011 Criteria for Accrediting Engineering Programs document (ABET, 2009) requires from students both, "(f) an understanding of professional and ethical responsibility" and "(h) the broad education necessary to understand the impact of engineering solutions in

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a global, economic, environmental, and societal context.” Another example, more closely related to the profession, is the National Council of Examiners for Engineering and Surveying (NCEES, <http://ncees.org>), which includes some questions on professional ethics in the examinations for the professional engineering license in all 50 states of the US. Also, most of the industries have set ethics training and corporate social responsibility in their policy. In some cases, it may be argued that it is just advertising or make-up looking for greater profits. Certainly, it is so, but not always. Companies have learnt that sustainable practices and fair relationships are not only good for the society and the environment, but also they can increase the reputation, productivity, and employee growth of their own businesses.

The purpose in this chapter is to discuss primal issues related to the teaching and learning of EE at universities. In order to be able to understand this complex panorama, a set of questions are formulated and examined from multiple perspectives. The answers supplied here come mainly from both philosophers and engineers who have either taught this subject somewhere in the past or have been teaching in engineering institutions. Here we presume that success requires both outlooks: theoretical and practical, reflection and experience. Further it needs to work together and share common goals. The below questions are formulated for examination.

1. Why EE education?
2. What should be the objectives of EE education?
3. What should be taught in EE?
4. Who can teach EE best?
5. Is it possible to create an impact in student’s moral attitudes? Is it desirable?
6. Are there any ethical requirements for engineering students to study EE?

## **BACKGROUND**

In the process of review of the teaching and learning in EE education something is quite clear, namely that many issues are not so clear. Certainly, this fact does not come as a surprise. Applied ethics is not a technical subject, whereas good teaching is not a mechanical, routine activity. Both operate, now and then, in dynamic situations. They are highly dependent on cultural context, personal experience, human relationships, and environment. Therefore, the fact that the object of study is not so clear means that there is no broad consensus found on the following fundamental issues. To start with, is an EE course really necessary for engineering students? If the conclusion is *yes*, then, what should be the curriculum of this course? What should be the goals of this course? How should it be taught? Is EE a unique subject that differs from other professional ethics? Moreover, things are not straight and easy because even if some consensus are obtained, the problem still arises that engineering curricula are much overburdened and well established. Thus, it is often a real challenge to add new compulsory subjects to them.

In an interview with Derek Bok, ex-President of Harvard University (1971–1991 and 2006–2007), published in *The Civic Arts Review* (CAR, 1988), we may read:

**CAR:** *Do you think the concern for ethics indicates one of those seismic shifts in public opinion that every now and again overtakes the American people?*

**Bok:** *That may well be the case. During most of the twentieth century, first artists and intellectuals, then broader segments of the society, challenged every convention, every prohibition, every regulation that cramped the human spirit or blocked its appetites*

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