

Report on
A Survey of Schools of Engineering
In the United States concerning
Standards Education¹
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2003 Survey of Schools of Engineering in the United States

In the Fall 2003, the Center for Global Standards Analysis (“Center”) initiated a survey on standards education activities at schools of engineering among top universities in the United States.² The purpose of the survey was to contact the school of engineering at each university and determine whether the school of engineering offers a separate course on standards, one or more lectures on standards, or whether the subject of standards is integrated into one or more existing curriculums.

More than 100 universities were contacted. The response rate for the survey was approximately 20%. The Center believes responses provided by universities who responded are typical of most engineering schools in the United States, and represent a reasonably accurate picture of standards education within schools of engineering. Set forth below are the Center’s conclusions, survey questions and representative answers.

Major Findings of the Survey³

1. Standards education is not a priority issue among schools of engineering in the United States;
2. Schools of Engineering in the United States do yet not accept the critical nature of standards in the new 21st century global economy.

Survey Questions and Answers

1. **What undergraduate or graduate standards education courses are offered within your School of Engineering that are intended to facilitate an understanding of standards and the role that standards play in engineering or the economy?**
 - We do not have any courses on standards.
 - We offer no courses that are solely focused on standards.
 - At the moment, there is no engineering course that is explicitly focused on standards as its primary content.
 - Our university does not have any courses dedicated exclusively to the discussion of standards.
 - No courses are offered that I know of which have standards as their primary or exclusive topical content.
 - We have no courses whose primary focus is on standards. Rather, standards are addressed as appropriate in upper division and graduate courses.

² The Center used the index of top universities created by *U.S. News & World Report* for 2003 as the basis for selecting universities to be included in the survey.

³ There appear to be only 3 schools of engineering in the United States that offer a course on standards: The Catholic University of America, the University of Colorado (Boulder); and the University of Maryland. It appears that the subject of standards is covered at most schools of engineering in design or engineering ethics courses.

2. If the School of Engineering does not offer any standards education courses, are there any undergraduate or graduate courses that contain one of more lectures on standards and the role that standards play in engineering or the economy?

- Electrical Engineering reports the following: courses in telecommunications have one or more lectures that cover telecom standards, in particular, an upper level electrical engineering course would address the economic aspects of telecommunications standards. It is possible that new courses could be developed in collaboration with the economics department that would specifically address the economics of telecom standards.
- Typically, design-oriented courses contain elements on standards. This is especially true of senior capstone projects.
- All curricula cover this area to varying extents, appropriate for their respective professional fields. For example several courses in Industrial Engineering focus on ISO standards of practice, both in financial and manufacturing matters. Several Materials Science and Engineering Department courses deal with American Society for Testing and Materials, and American National Standards Institute standards, while several Mechanical Engineering courses teach the value of Society of Automotive Engineering standards. In biomedical engineer, we also deal with Food and Drug Administration based issues -- some of which are called standards and some have other names (but the essence is the same). Civil Engineering has many courses that deal with codes, laws, and standards.
- Standards were not addressed in electrical engineering but standards are discussed in two lectures in the senior design course.
- My guess is that there is one course or so in each of our 12 engineering majors that have some lecture material related to standards. Architectural Engineering, Civil Engineering and Mechanical Engineering may give more attention to codes and standards, say, in several courses, but feedback on this has never been formally solicited from the departments.
- Specific standards are described in numerous undergraduate and graduate courses. However, there is no general presentation on the role that standards play in engineering or the economy.

3. What steps, initiatives, or programs need to be taken to enhance the development of standards education at the undergraduate and graduate levels in your School of Engineering?

- I did not get the sense from the faculty whom I polled that they felt that there is a gap in our current curriculum in this area such that it would displace other curricular content.
- The current coverage seems adequate for our programs. When we apply outcomes assessment to our alumni and recruiters, we do not note a deficiency in this topic.
- Obviously "integration" is the best mode of instruction for a cross-topic matter such as engineering standards.

- The availability of limited use sets of standards for teaching purposes would greatly facilitate the use of standards in teaching. For example in the senior mechanical engineering design class diverse products are subjects of design projects but our library does not have anything resembling a complete set of standards. For example the ASME, ANSI and ASTM standards are NOT available, presumably because their cost is prohibitive.
- Faculty need to be more aware of the role of Codes and Standards and given access to good educational materials (modules or other information) that will aid in presenting/communicating this to students.
- A general presentation on the role of standards should be developed for inclusion in appropriate courses in each of the engineering undergraduate programs.

International Academic Activities on Standards Education

The approach to standards education among schools of engineering in the United States appears to be similar to that in Europe. The European Commission (“EC”) has created a catalogue of all universities in EC countries that are engaged in standards research and/or education.⁴ The EC catalogue indicates that although several universities are engaged in standards research and/or education activities, relatively few schools of engineering are engaged in standards education activities. In fact, most EC academic standards education programs appear to be offered in schools of economics and business. The EC catalogue also indicates that several standards development organizations offer standards education courses.

In 2003, the countries of China, Japan and South Korea signed a joint agreement to coordinate development of their standards education activities.⁵ It should also be noted the Institute of Metrology (China), Hanoi National Economics University (Vietnam), Institute of Technology Bandung (Indonesia), and the University of Moratuwa (Sri Lanka) have established a joint program with the University of the Federal Armed Forces Hamburg (Germany), and Erasmus University (Netherlands) to create a course for a master’s degree curriculum based upon an internet e-learning platform.⁶

In January 2004, the Canadian Council of Professional Engineers and the Canadian Engineering Accreditation Board announced that Standards and Codes would be part of the accreditation criteria for all Canadian Engineering University programs. Specifically, Canadian Engineering University programs must have: (1) standards and codes as library resources; (2) standards and codes as part of engineering programs, (3) faculty evaluations that review standards development work. These changes go into effect in 2006.

⁴ See http://ECropa.EC.int/comm/enterprise/standards_policy/academic_network/index.htm

⁵ See report on “Standards Education in Korea” presented at the International Workshop to Develop a Standardization Education Model (by Man Han Hwang, Standards R& D Team, Korean Standards Association November 2003).

⁶ *Id.*

The Center's View of Standards Education in Engineering Schools

While the Center's survey findings indicate that standards education is not a priority among U.S. engineering schools, the Center believes that it should be. Much of today's world is governed by technology. Because engineers play a vital role in the development and maintenance of technologies that improve the quality of life, engineers should be provided with educational programs that focus on the significance of standards and the process of standardization early in their education.

In a world where the marketplace is global in scope, there are very real and practical incentives for standards and the process of standardization to become a top priority. International technical standards and regulations have a direct effect on more than 80 percent of world [product] trade with an estimated value exceeding \$4 trillion.⁷ This fact has not been lost on the engineering and business schools outside of the U.S. Based on what is happening in the global market and at universities outside of the U.S., the Center believes U.S. Schools of Engineering should reconsider whether to make standards education programs and curriculums a top priority.

The Center for Global Standards Analysis

The Center was formed in 1999 as a non-profit corporation located at The Catholic University of America.⁸ The Center was formed for the purpose of creating global standardization education programs for university graduate students, associations, corporations, government departments and agencies; and for conducting research programs related to global standardization. During the period 1999-2001, a course on *Strategic Standardization* was jointly offered to engineering and law students. Several standards development organizations, associations, corporations, government departments and agencies, law firms and testing laboratories provided speakers to help support the course. During the fall 2003, the course was continued at the School of Engineering. For further information on the Center and the course for *Strategic Standardization*, please consult the Center's internet web site:

http://engineering.cua.edu/StandardsCenter/center_for_global_standards_anal.htm

In the fall of 2002, the Center initiated a survey of professionals experienced in the development of private sector voluntary standards. The purpose of the survey was to gather information, ideas and concepts to help facilitate the further development of standards education programs. The Board requested each Member to contact at least 10 individuals and request them to participate in the survey. Participants in the survey included individuals from standards development organizations, associations, corporations, government departments and agencies, and testing laboratories. The survey was published in March 2003 and is available on the Center's website.

⁷ See Report on "Regulatory Reform and International Standardization" at 9-10. (published by the Organization for Economic Co-operation and Development (1999))

⁸ For a discussion of the Center's formation, see two articles: (1) *Launching a "Center for Global Standards Analysis" at CUA*, Standards Engineering Society Journal at 1 (June 1999), and (2) *A New Center for Global Standards Analysis*, ASTM Standardization News at 26 (September 1999).