ASEE and How Standards Find Their Way into the Classroom

William E. Kelly, Ph.D., P.E.
Director of External Affairs ASEE
September 18, 2013
Overview

• Standards in Engineering Education
• Sustainability in Engineering Education
• Standards AND Sustainability in Engineering Education
• Where are we going?
• How can we get there faster?
• How can ASEE help?
Standards in Engineering Education

Drivers:

• Faculty initiatives
• Industry demand
• Engineering societies
• ABET Criteria
  – Criterion
  – Constraints
  – Outcomes
Engineering Education

• ABET is a major driver of undergraduate education in the U.S. and increasingly internationally

• U.S. engineering societies (ABET is a federation) working together define general accreditation criteria that apply to all engineering programs

• Engineering societies define program criteria that apply to fields e.g. electrical engineering
ABET EAC Criterion 4
Curriculum

• Students must be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints.
American Society for Engineering Education

• Place to go to find out what faculty (E&ET) are doing in the classroom

• Annual conference
  – Papers
  – Exhibit
  – Workshops

• Regional conferences

• You can get an overview by searching conference papers online since 1996
ASEE Conference Proceedings Search

Search Fields:
- Title
- Author
- Session Title
- Conference
- Year

The system for boolean searching in field name query with support for boolean AND and OR keywords. The searchable fields are: title, an example: “Title AND year 2010” searches for all papers on Title in 2010.

Type a search term in the box above.

You may also browse session listings for past conferences:
- 2013 ASEE Annual Conference
- 2012 ASEE Annual Conference
- 2011 Annual Conference & Exposition
- 2010 Annual Conference & Exposition
- 2009 Annual Conference & Exposition
- 2008 Annual Conference & Exposition
- 2007 Annual Conference & Exposition
- 2006 Annual Conference & Exposition
- 2005 Annual Conference
- 2004 Annual Conference
- 2003 Annual Conference
- 2002 Annual Conference

The following conferences do not have a session listing but are still available for paper searches:
- Search for 2001 Annual Conference
- Search for 2000 Annual Conference
- Search for 1999 Annual Conference
- Search for 1998 Annual Conference
- Search for 1997 Annual Conference
- Search for 1996 Annual Conference

Search from 1996 To 2013
Introduction of Standards

• A number of ASEE conference papers on this
• Workshops – national and regional
• Engineering societies and others e.g. ASTM, ANSI, and SES working on this
Search "standards"

ASEE Conference Proceedings Search

Search Fields

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The syntax for boolean searching is field_name:query with support for boolean AND and OR keywords. The searchable fields are:

Example: "Teams AND year:2010" searches for all papers on Teams in 2010.

standards

Displaying papers 1 - 50 of 1000 in total

file://localhost/E:/search/conference/17/AC_2008Full2875.pdf

... AC 2008-2875: HOW TO INCORPORATE NATIONAL AND INTERNATIONAL STANDARDS INTO ENGINEERING & Bruce Harding, Purdue University. © American Society for Engineering Education, 2007. How to incorporate ...
Incorporating Engineering Standards in the Major Design Experience

William E. Kelly
The Catholic University of America

Introduction

The ABET Criteria for Engineering programs require students to incorporate engineering standards in the culminating design experience. The United States National Standards Strategy (NSS) calls for increased efforts to educate future leaders in engineering, business and public policy on the value and importance of standards. There is a unique opportunity for the standards community to assist academe in incorporating engineering standards in undergraduate engineering curricula and at the same time accomplish one of the goals of the NSS.
ASEE Regional Workshop 2004

Workshop Reaches Out to Engineering Educators to Promote Standards Knowledge

New York April 13, 2004

Recent studies in the United States and Europe have revealed a lack of support related to standardization as study matter in higher education, and indicated that standards training and education is most often seen as a professional activity. As part of a collective goal within the standards community to promote the integration of standards and conformity assessment in university curricula, ANSI is co-sponsoring a faculty workshop for the American Society for Engineering Education (ASEE) to be held in conjunction with the ASEE Fall Regional Conference. The workshop, "Incorporating Standards into Capstone Design Courses," will be held at the Catholic University of America in Washington, DC, on October 22, 2004.

Co-sponsored by ANSI, the Catholic University, and the National Institute of Standards and Technology (NIST), the workshop will bring together panelists from industry, government and academia to provide insight into the world of voluntary standards, and offer techniques for incorporating standards and conformity assessment-related topics in university curricula.
ASTM is a Corporate Member Of ASEE and Exhibits At the ASEE Annual Conference
ASTM and IEEE Team Up for Capstone Design Conference

Shown from left to right at the Capstone Design Conference: James Olshetsky, ASTM International; Bruce Harding, Purdue University; Amin Karim, DeVry University; Laura Hitchcock, Boeing; Robert Noth, John Deere (retired); and Howard Woltman, Lumispec.

As part of this year’s Capstone Design Conference, ASTM International and the Institute of Electrical and Electronics Engineers recently teamed up on the campus of the University of Illinois to organize an interactive session on the importance of including technical standards education in engineering curricula.

The conference is the third in a series, held previously in 2007 and 2010. The aim of the Capstone Design Conferences is to build a community of educators, students and industry to discuss, analyze and improve capstone design courses typically offered during the senior year in most engineering curricula. The theme of this year’s conference was industry involvement in capstone design.
Standards Education

As the world’s leading standards developer, IEEE is also a leading source of information and resources on standards, their applications, and their impact on designing new products, processes, and services.

Commitment to standards education

IEEE is committed to:

- promoting the importance of standards in meeting technical, economic, environmental, and societal challenges;
- disseminating learning materials on the application of standards in the design and development aspects of educational programs;
- actively promoting the integration of standards into academic programs;
- providing short courses about standards needed in the design and development phases of professional practice.
The State of the Use of Standards in Engineering and Technology Education

Abstract

During the past several decades, the economy of each nation has been significantly affected by globalization and technology. Government regulations and private sector standards affect a majority of world trade. Countries have been working together to establish international standards in almost every field. As a result, workers in all sectors need to have an understanding of standards. Engineering and technology students must not only possess an understanding of engineering standards and applicable government codes, but also learn to apply them in designing, developing, testing and servicing products, processes and systems. ABET's criteria for engineering and technology education require students to learn and apply standards in their class projects.

This paper is a follow-up of a 2006-2009 NSF initiative awarded to IEEE to help develop tutorials and case study modules for students and encourage standards education at college campuses. It presents the findings of a faculty/institution survey conducted through Electrical Engineering and ETD listservs representing the major engineering and technology disciplines during fall 2012. The intent of the survey was to gauge the status of use of standards and regulations in engineering and technology coursework and to identify benchmark practices. In light of survey findings, recommendations are made to standards development organizations, industry and academia to help enhance the use of standards in engineering and technology curricula.
ASEE Annual Conference 2013

Figure 2: Response distribution of impediments to teaching and learning of standards.
Sustainability

GRAND CHALLENGES FOR ENGINEERING
SEE HOW ENGINEERS CAN MAKE A WORLD OF DIFFERENCE

Build Your Dream

Theme: Sustainability  Theme: Health  Theme: Security  Theme: Joy Of Living
Criterion 3

(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (Bold and underline added)
ASEE Conference Proceedings Search

Search Fields
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The syntax for boolean searching is field_name:query with support for boolean AND and OR keywords. The searchable 1

Example: "Teams AND year:2010" searches for all papers on Teams in 2010.

sustainability

Displaying papers 1 - 50 of 1000 in total

file://localhost/E:/search/conference/14/AC_2007Full1619.pdf
... AC 2007-1619: SUSTAINABILITY IN CIVIL ENGINEERING EDUCATION AND PRACTICE - A MODULE TAUGHT BY FACULTY AND COMPANY MEMBERS. Carsten Ahrens, F.H. OOW. © American Society for Engineering Education ...

... AC 2008-434: ENGAGING CAMPUS COMMUNITIES IN PROMOTING ENVIRONMENTAL SUSTAINABILITY ON COLLEGE CAMPUSES. Sherief Sheta, East Carolina University. Robert Chin, East Carolina University. © American ...
Challenges

Figure 2: Percent Responses from Civil and Environmental Engineering Department Heads 2010 Survey Related to Barriers for Implementing Sustainable Engineering Courses.
Registration / Build Your Schedule

View Session

U264D WORKSHOP: Engineering Education for a Sustainable Future
Workshop · Sponsored Sessions
Sun. June 23, 2013 9:00 AM to 4:00 PM
Georgia World Congress Center, A315

Session Description

Free ticketed event
Two 3-hour workshops: a “beginners” session and an “advanced” session.

For the “beginners” session (morning):

What is “Education for a Sustainable Future”? What are the unique and important strategies that engineering educators can use regarding sustainability that will also engage students in learning disciplinary content? This workshop will describe national trends and resources that are available for educators. Participants will learn about vetted resources and strategies they can easily use in existing courses to improve student learning while helping students develop needed skills to address urgent societal challenges.

For the “advanced” session (afternoon):

...
Standards AND Sustainability
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Search Fields

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- Session Title
- Conference
- Year

The syntax for boolean searching is field_name:query with support for boolean AND and OR keywords. The searchable fie

Example: "Teams AND year:2010" searches for all papers on Teams in 2010.

standards AND sustainability

Displaying papers 1 - 50 of 1000 in total

Sustainability And International Standards
... AC 2008-353: SUSTAINABILITY AND INTERNATIONAL STANDARDS. David Reisdorph, the GreenTeam Inc.
David Reisdorph provides environmental science, economic, policy and survey analysis expertise ...

Author: David Reisdorph
Session Title: Sustainability and Engineering Courses
Conference: 2008 Annual Conference & Exposition
Year: 2008

Challenges for Integration of Sustainability into Engineering Education
... sustainability competency standards are also expected to affect the curricular structure at the institutional level which would drive sustainability education in typical engineering education13 ...

Author: Dr. Qiong Zhang (University of South Florida), Dr. Linda Vanasupa (California Polytechnic State University), Dr. James R. Mihelcic (University of South Florida), Dr. Julie Beth Zimmerman (Yale University), and Simona Platukyte (University of South Florida)
Session Title: Integrating Sustainability Across the Curriculum
Conference: 2012 ASEE Annual Conference
Year: 2012
David Reisdorph, the GreenTeam Inc.

David Reisdorph provides environmental science, economic, policy and survey analysis expertise to the GreenTeam, Inc. He has extensive environmental and economics analysis experience with the Mid-America Regional Council, Midwest Research Institute, and University of Missouri-Extension. Mr. Reisdorph is an Environmental Science doctoral student at Oklahoma State University, and has a B.S. in Agricultural Economics (1982) and an M.A. in Political Science (1985) from Oklahoma State University. Also, he completed graduate coursework (all but dissertation) in Political Science at the University of Kansas. His professional and community activities include:

Sustainability and International Standards

Abstract

This paper describes the need for courses that link standards and sustainability and reviews an Oklahoma State University Environmental Science graduate course in Sustainability and International Standards. The course conveys the importance of voluntary international standards, such as from ASTM International or the International Organization for Standardization (ISO), to sustainability. The curriculum uses an innovative experiential learning approach whereby students research and develop a standard using the ASTM International process. One driven student joined ASTM International and worked to see her class project catalyze the publication of ASTM E 2348 Guide for Framework for a Consensus-Based Environmental Decision-Making Process.
An Example Of A Standard That Could be used By Students In Capstone Design
NSPE BOK (2013)

- Standards as an engineering tool
- Quality control and Quality Assurance
- Safety
- Legal Aspects of Engineering
- Public Policy and Engineering
  - Explain how codes and standards are set and how public policy affects their development;
Sustainability is an Evolving Area for Engineering Practice

Figure 1: Sustainable Manufacturing - A closed loop view
Reaching Students & Faculty

• Challenges in “practice areas” e.g. standards, ethics, sustainability.
• Modules that faculty can easily incorporate into courses
• Entire courses
• Student self study
• Strategy – students or faculty first?
Welcome to StandardsLearn.org!

This web resource provides easy-to-use, self-paced educational tools for everyone who wants or needs an introduction to standards and conformity assessment activities. Our e-Learning content highlights the value and importance of standards and compliance programs in the U.S. and around the globe. Make your way through the courses and explore our related educational resources and you’ll gain an understanding of key organizations and processes.

The e-Learning courses shown below are free and provided as a public service of the American National Standards Institute (ANSI):
Access to Standards in the Classroom

As the U.S. Member Body of the International Organization for Standardization (ISO), ANSI has been authorized to provide, upon request, complimentary access for students and faculty to selected standards currently available in the ISO collection. If needed, certain standards from the International Electrotechnical Commission (IEC) may also be made available.

These collections are comprised of nearly 20,000 standards, which can be made available to faculty and students in all disciplines in institutions of higher learning throughout the United States.

This addresses concern raised in IEEE survey – how to get the word out?
How Standards Developers Can Help

A key component of this initiative is the pooling of existing resources that will facilitate the ability of faculty to bring standards into their classrooms. Members of the standards development community are encouraged to participate by providing educational and technical content that will help to support this initiative.

Standards Developers can help by:

- Designating a point of contact and identifying resources within the organization that could be made available to university faculty and students
- Indicating to ANSI all areas of expertise in which your organization would be willing to serve as a resource to relevant university programs eager to introduce standards

This information can be sent to training@ansi.org
Education about standards

International Standards bring technological, economic and societal benefits. They help to harmonize technical specifications of products and services, making industry more efficient and breaking down barriers to international trade. International Standards also contribute effectively to sustainability, by providing good practices on the use of technologies and the management of processes affecting economic, social and environmental aspects.

Educational institutions are increasingly recognizing these benefits and international standardization features in many curricula. We recognize the vital contribution educational institutions bring to raising awareness of standardization and its benefits, and are keen to support their work.
ISO repository of teaching materials

The ISO repository of teaching materials is a list of existing teaching materials on standardization, with details of the authors and publishers. Teachers and standards professionals can use this tool to access information that can help them in designing and delivering courses on standards matters. In addition, the repository will help optimize the use of resources, facilitate the re-use of existing materials and highlight new subject matters to be addressed in the future.

These resources cover education at the university-level as well as education about standardization at primary and secondary level.

Please note, the majority of material in these repositories is not published by ISO. Please contact the publisher in order to find out more about how to use this material, licensing fees etc.
Teaching Materials

- Appears to be no shortage of teaching materials on standards or sustainability
- Are they classroom ready?
- Are they ready for self study by students?
Systems Model for Improving Standards and Retention In Engineering Education


This paper describes a systems model for improving standards in engineering education and at the same time maintaining high retention rate for all engineering students in the educational system. A systems approach methodology adopted for this research is a technique of taking into account all relevant factors affecting quality education and student retention...

Learn more about this resource »
Connexions is:
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- authors create and collaborate
- instructors rapidly build and share custom collections
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More about us...

FEATURED CONTENT

OpenStax College Physics
This 1300 page introductory, algebra-based, two-semester college physics book is grounded with real-world examples, illustrations, and explanations to help students grasp key, fundamental physics concepts.

College Physics is the first of a planned 20 college textbooks to be released by OpenStax College. This online, fully editable and customizable title includes learning objectives, conceptual questions, links to labs and simulations, and ample practice opportunities to solve traditional physics application problems.

OpenStax College Introduction to Sociology

FIND CONTENT

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- How to create a module in minutes

Guides and tutorials
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- Connexions Tutorial and Reference

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FREE professional-grade textbooks.

In just a few months, OpenStax College's free and
Search for Content

621 results for: engineering AND standards

Limit search to:  
- Title
- Author
- Collections
- All Subjects

Sort by: Relevance
Results per page: 10

View: Detail | Compact | Statistics

International Standards in Engineering Education (m19061)

Author: Bill Kelly

Keywords: ABET, accreditation, education, engineering, international, standards

Summary: The ABET ... engineering standards in the major design experience. Although there is not complete agreement on what an international standard is, they will increasingly affect engineering design in all areas of engineering. In addition to using international standards in design, as part of their preparation for professional practice, it is desirable that graduates ... of standards. [Expand Summary]

Subject: Science and Technology
Language: English
Popularity: 66.34%
Revised: 2008-12-27
Revisions: New
Standards in Sustainable Infrastructure

Module by: Bill Kelly.

Summary: Introduction to engineering standards with focus on sustainability and specifically on sustainable infrastructure

Standards in Sustainable Infrastructure

Abstract

This module is intended to introduce students to engineering standards in the context of design of sustainable infrastructure.

Learning Objectives

After reading this module, students should be able to:

- Explain the role of standards in sustainable infrastructure
- Find examples of standards relevant to sustainable infrastructure
- Explain what a rating system is
- Explain how standards and public policy are interconnected

Standards

For a general introduction to standards, consult the web sites for ANSI\(^1\), and ASTM\(^2\). For some definitions, see SES.\(^2\)
nanoHUB.org - Simulation and More for Nanotechnology

now on iTunes U

RESOURCES

Keyword or phrase: 

Popular Tags: nanoelectronics, course lecture, Illinois, material science, nanotransistors, nano/bio, NanoBio Node, UIUC, research seminar, devices, nanophotonics, quantum transport, transistors, tutorial, NIEGF, carbon nanotubes, nano-electro-mechanical systems, molecular electronics, nanomedicine, Simulation, education/outreach, MOSFET, band structure, optics, ABACUS, More tags

Animations, Compact Models, Courses, Databases, Downloads, Learning Modules, Online Presentations, Presentation Materials, Publications, Series, Teaching Materials, Tools, Workshops...

All Categories

FEATURED

nanoHUB-U: FREE self-paced nanotechnology courses now available courtesy of the nanoHUB-U faculty.

Nanosphere Optics Lab: Optical properties of nanospheres suspended in water, air, or other solutions - in Tools

Modeling Quantum Transport in Nanoscale Transistors - in Publications

Jimmy K. Hsia, University of Illinois at Urbana-Champaign - Contributions: 8

ECE 659:009 Homework 2 (Lectures 5-12) - in Teaching Materials

ME 587 Lecture 2: STM Experimental Considerations - featured on iTunes U

Local electric field of nanomaterial - asked by Syed Md. Shahnar Abdullah, in Answers

NOTABLE QUOTE

In just one hour, a lecture on nanoHUB.org helped me understand how percolation works on semiconductive polymer blends. I’m really excited about ... . . .

Julio Castilla, Undergraduate student, Universidad Autónoma de Nuevo León, Mexico (2011) - in Notable Quotes

NEW IN RESOURCES

MSE 597H Lecture 6: Electrochemical Equilibrium II in Online Presentations, Sep 02, 2013
Voltage Asymmetry of Spin-Transfer Torques in Publications, Sep 02, 2013
Quantitative Model for TMR and Spin-transfer Torque in MTJ devices in Publications, Sep 02, 2013
MEEPPV in Tools, Aug 29, 2013
Overview of FRACE in Online Presentations, Aug 29, 2013

More new resources
What?

With support from the National Science Foundation (NSF), the American Society for Engineering Education (ASEE) is leading an effort to develop a sustainable virtual community of practice (VCP) model for faculty development. The VCP approach builds on the existing face-to-face faculty development models, on the engaging community of practice models, and on the rapidly developing and increasingly accepted web-based social networking and content management tools. By engaging in this project, participant faculty members will gain a deeper understanding of research-based instructional approaches and will begin to implement these approaches in their classrooms.

When?

Cycle 2 VCPs

The second cycle of Faculty VCPs will start in October and run through May of 2013. Each VCP will hold weekly meetings lasting approximately 60 minutes and encourage additional web-based interactions throughout the week.

Application Deadline Extended!

Applications are due by Friday, September 13, 2013 - Friday, September 20, 2013. Visit the Apply section to learn how to become part of the ASEE-VCP project! Selected individuals will be notified by October 4, 2013.
Summary

- You are making progress
- ASEE is a good venue both papers and workshops national and regional
- How could ASEE help?
- Challenge to infuse “practice” aspects of engineering into engineering curricula
- How to leverage other activities e.g. sustainability?
- Other delivery mechanisms