

IEEE Standards Education

A Career Commitment

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IEEE Standards Association
IEEE Educational Activities Board

Promoting Education About Standardization in North America

8 May 2009



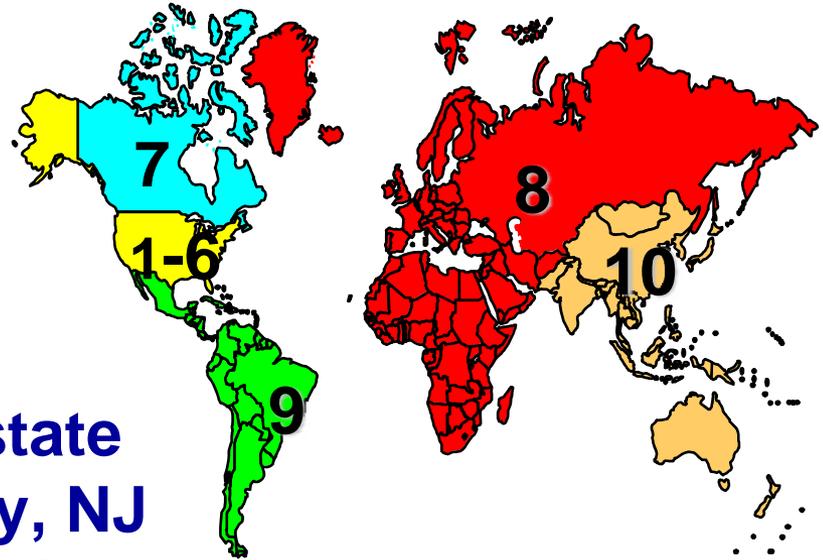


The IEEE in a glance

- IEEE is a professional association focused on scientific and technical goals
 - Established 1884 in preparation for a Franklin Institute Exhibition in Philadelphia
 - ...directed toward the advancement of the theory and practice of **electrical, electronics, communications and computer engineering... computer science ...and allied branches of engineering and arts and sciences**
- Since its inception, IEEE was engaged in standards and standardization
 - Originally – in power, telegraphy, telephony

IEEE Today

- **Largest technical professional association in the world**
 - Over 365,000 members
 - More than 70,000 students
 - Sections in 150 countries
- **Facts:**
 - Incorporated in New York state
 - Headquarters in Piscataway, NJ
 - Newest office in Beijing, China
- **Approximately 1000 Staff members**





Development of Standards

- **The IEEE's Standards Association develops and maintains standards in a broad-range of industries, including:**
 - **Power and Energy**
 - **Computing and Communications**
 - **Industrial Applications**
 - **Transportation**
 - **Biomedical and Healthcare**
 - **Nanotechnology**



IEEE's key interests in Education about Standards

- **At the pre-university level**
 - TryEngineering.org
 - Teacher In-Service Program
- **At the university level**
 - Development of curricula
 - Accreditation criteria
 - Providing an “entry point” to the world of standards
- **At the post-university level (continuing education)**
 - Familiarizing engineers with the standard development process
 - Education about specific standards (e.g., the IEEE 802 family)

Target Audiences

- Undergraduate Students
- Graduate students
- Educators
- Entry-level technology professionals
- Candidates for licensure
- Experienced technology professionals
 - Standards developer
 - Product developer
 - Standards manager
- Marketing professionals
- Business leaders
- SSO/SDO
 - Committee leaders
 - Committee participants
 - Governance participants

Academic Disciplines

- Undergraduate Students
- Graduate students

- Engineering
- Computer Science
- Information Technology



The General Objective

- **Objective: Define a role for standards in mainstream education for**
 - **Engineers**
 - E.g., telecomm, biomedical, electrical, power
 - **Computer scientists**
 - **IT professionals**



Some of the hurdles...

- **Many academics and practitioners do not understand the centrality of standards in the discipline**
 - Standards are seen as the opposite of creativity in design
 - In many curricula economic constraints, legal constraints, compliance and interoperability are considered secondary
 - ..and sometimes absent
- **Techniques and devices based on standards are often taught with little or no regard to standards**
 - ...taught without referring to the standardization infrastructure
- **Many graduating students have never seen a standard, do not know how to tackle one or find one**
 - Standards are often not used in “capstone” projects of Engineering programs

ABET Engineering Criterion 5 – 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



ABET Engineering Technology

- **Aeronautical Engineering Technology**
 - “Associate degree programs must demonstrate that graduates can apply the following principles...: “
 - “Technical expertise in...industry standards, regulations and documentation”
- **Drafting/Design Engineering Technology**
 - “Graduates of baccalaureate degree programs...must demonstrate...competency in the application of current codes and standards”
- **Similar statements in criteria for *Nuclear* and *Surveying* Engineering Technology**

Computing: ABET Information Systems Program Criteria

- “Curricula are consistent with widely recognized models and standards”
- Information Technology
 - “An understanding of best practices and standards and their application”



Additional Hurdles...

- **Industry technical professionals often assume that standardization is performed by large corporations and the government**
- **Professionals complain that information about standards updates never gets to them**
- **It is often difficult to understand interrelationship between standards**
- **Standards are viewed as not being user-friendly**



How do we address the challenges: university curricula

- **Development of instructional material on key standards for use in the undergraduate engineering, computing, and engineering technology classroom**
- **Material that can be used by the current teaching staff and can be integrated into existing topical classes**

How do we address the challenges: accreditation of academic programs

- **Accrediting bodies need to clarify the degree to which understanding and use of standards are expected in engineering/computing/technology programs**
 - In the US the current ABET accreditation criteria are often too vague and hence unenforceable
- **A clear accreditation requirement would translate into sections about standards in textbooks**

How do we address the challenges: licensing

- **US: Several *Principles and Practice* Exams require familiarity with standards**
 - National Electric Code for EE exams
 - Design Standards for Civil and Structural Engineering exams
- **The question of wider use of design-oriented standards deserves additional discussion**
 - E.g., elements of IEEE Std 802.11b™ in a question about network design



How do we address the challenges: Continuing Education about Standards

- **Standards are of growing significance to industry**
 - **Further suggests the importance of introducing standards to students and into curricula**
- **Practicing professionals need to understand how to use standards**
- **Understanding the culture and process of standards setting is critical**
- **Resources and options for face-to-face and online learning are needed**



Some of IEEE's current activities

- Developing a **policy paper** on the role of Standards in academic programs in Engineering, Technology and Computing
 - Part of the work plan of the IEEE Standards Education Committee
- Will state the desired role of technical standards in the academic curriculum
 - Programs in engineering and computer science
- Will be used in model curriculum development and in discussions with accrediting bodies

IEEE's current activities...

- **Access to IEEE Standards**
 - **About 450 schools worldwide have full access to IEEE standards through the IEEE/IET Electronic Library**
 - **About 10 schools make use of this feature...**
- **Providing free educational content online through Standards Education web portal**

IEEE Standards Education Portal

<http://standardseducation.org/>

IEEE - IEEE Standards Education

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

Resources

- [Why Standards Education](#): discover why standards education is important
- [News & Features](#): citing articles, papers, and book reviews etc. on standards and/or standards related to education
- [Tutorials](#): providing information on how standards came about, how they are classified, how they impact future development and how they benefit the economy
- [Case Illustrations](#): describes the application of standards to achieve a specific design objective
- [Student Applications Papers](#): illustrating specific standards applied to a task. These are applications submitted by students and/or their faculty mentors which describe the way specific standards were applied to a task and how they impacted the design process.
- [Standards Reference Directory](#): offers an alphabetical listing of standards development bodies and other associations supporting the teaching of standards in undergraduate engineering and engineering technology programs

What do you want to do?

- [Find a standard](#)
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<http://www.ieee.org/web/education/standards/index.html> (1 of 3) [6/26/2008 10:13:09 AM]

IEEE Standards Education Portal **<http://standardseducation.org/>**

- Development funded in part by the US National Science Foundation
- Aims to provide university educators and students with opportunities to learn how to read standards and understand them
- Supports the incorporation of the teaching of standards in the undergraduate engineering and engineering technology programs

<http://standardseducation.org/>

- **Provides free online tutorials and case studies**
 - Standards, their applications, and their impact on designing new products, processes, and services
- **Offers IEEE Mini-Grants for students and faculty advisors for graduate and capstone design projects with an industry standards component**
- **Contains useful content for practicing professionals**

IEEE's current activities in Continuing Education about Standards

- **Delivering Face to Face Workshops/Seminars**
 - For practicing professionals who need to understand how to use standards
 - Standardization process
 - General education about standards
 - Specific standards or family of standards
- **Developing a Standards Lecturers Program**
 - Standards experts, topics and content based on audience

Standards Education for Practitioners

- **IEEE Expert Now modules on standards**
 - IEEE's main continuing education platform
 - A collection of 1-hour long on-line learning modules
 - Developed by leading experts
 - Usually on the basis of conference workshops
 - Professionally produced
 - Easy to use player-viewer, audio and video files, diagrams, animations, and automatic place marking
 - Provide CEUs

First Expert Now Standards Courses

- **Introduction to IEEE 802[®]**
- **Introduction to IEEE Std 802.11[™]**
 - **IEEE P802.11n MAC Layer**
 - **IEEE P802.11n PHY Layer**
- **Introduction to IEEE Std 802.15[™]**
- **Introduction to IEEE Std 802.16[™]**
- **Home Networking Standards**

http://www.ieee.org/web/education/Expert_Now_IEEE/index.html

Final Thoughts...

- **It may be useful to get the major players in standards education together in the same meeting for a working session**
 - **Deans**
 - **Industry Leaders**
 - **Accreditation Agencies**
 - **Governments/Departments of Education**
 - **Standards Organizations**
 - **Licensing Bodies**
- **We need to think of an appropriate broker**
 - **Professional Associations, a Learned Body (e.g., NAE), a Government Agency (e.g., NIST)**

Final Thoughts...

- **IEEE welcomes participation and partnership in our activities**
 - **Standards Education Committee**
 - **Content providers/partners**
 - **Invitations for Standards Lecturers or Speakers**
 - **At colleges, universities, or companies**
 - **Workshop and Seminar opportunities**

Questions or Comments

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