

Encuentro Internacional de Educaion en Ingerneria ACOFI 2106

Mechanical Engineering Department Experience with ABET and Industry Involvement in Engineering Departments

**William W. Predebon, PhD
ASME Chair, Engineering Education
J. S. Endowed Department Chair and Professor**

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Cartagena de Indias, Colombia

Michigan Technological University (www.mtu.edu)



800 km North of Chicago
in the
Upper Peninsula of Michigan

MichiganTech

Houghton, Michigan



MichiganTech

Michigan Technological University

○ Fall 2015: Total Enrollment: 7,238

‣ Undergraduate: 5,717

‣ Graduate: 1,521

‣ MS: 927

‣ PhD: 555

‣ Engineering: 65% with 8 degree programs

○ Mechanical Engineering: Largest department

‣ Enrollment: 1,767 (24.4%)

‣ Undergraduate: 1401 (24.5%)

‣ Graduate: 366 (24.1%)

• MS: 263

• PhD: 103

ABET Impact on Engineering Degree Programs

○ History

‣ *Engineering Criteria 2000 (EC 2000)*

- Prior to 2000 ABET accreditation of engineering programs was Input-based
- EC 2000 changed it to Outcomes- or Results-based curricula with continuous improvement
- This applied types of engineering or engineering disciplines, ME, CE, EE, ChemE, etc.
- Required General Criteria for all engineering degree programs
- Significant industry input
- Self Study required during year of record

ABET Impact on Engineering Degree Programs

○ *EC 2000*

- ⌘ Criteria 1: Students
- ⌘ Criteria 2: Program Educational Objectives
- ⌘ Criteria 3: Student Outcomes: A-K
- ⌘ Criteria 4: Continuous Improvement
- ⌘ Criteria 5: Curriculum
- ⌘ Criteria 6: Faculty
- ⌘ Criteria 7: Facilities
- ⌘ Criteria 8: Institutional Support
- ⌘ Program Criteria (BE, CE, EE, ME, etc.)

ABET Impact on Engineering Degree Programs

○ *ABET Accreditation Today*

∞ Criteria 3: Student Outcomes:

- ☞ A. (Ability to) apply math, basic science, engineering science
- ☞ B. Design & conduct experiments, analyze & interpret data
- ☞ C. Design as system, component, or process to meet realistic constraints
- ☞ D. Function on a multi-disciplinary team
- ☞ E. Identify, formulate & solve engineering problems
- ☞ F. Understanding of professional & ethical responsibility
- ☞ G. Communicate ideas effectively
- ☞ H. Broad education.. impact of eng. solutions on global, eco, env, soc
- ☞ I. Recog. of need for and ability to engage in life long learning
- ☞ J. Knowledge of Contemporary Issues
- ☞ K. Use modern techniques, skills, & tools for engineering practice

ABET Impact on Engineering Degree Programs

○ *ABET Accreditation Today*

☞ Criteria 3:

- ☞ Major design experience

☞ Program Criteria: Different for each type of engineering degree program,

- ☞ *Mechanical Engineering*: The curriculum must require students to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes; and prepare students to work professionally in either thermal or mechanical systems while requiring topics in each area.

ABET Impact on Engineering Degree Programs

○ *ABET Accreditation Today*

∞ Criteria 4: Continuous Improvement

- ☞ Assessment required of all outcomes with multiple measures
- ☞ Based on the results show improvement plan

∞ Criteria 6: Faculty

- ☞ Quality, workload, size, professional development, authority and responsibility (related to curriculum)
- ☞ Relationship of upper administrators (dean, provost, etc.)

ABET Impact on Engineering Degree Programs

○ *ABET Accreditation Today*

∞ Criteria 6: Curriculum (4 year assumption)

- ☞ One year of mathematics and basic sciences
- ☞ One and one half year of engineering topics including significant design
- ☞ General education

∞ Criteria 7: Facilities

- ☞ Offices, classrooms, laboratory facilities, safety, library, etc.

∞ Criteria 8: Institutional Support

- ☞ Leadership, budget, staffing, faculty hiring and retention, faculty professional development

Faculty Impact and Benefits

- It is a lot of work, some will complain but most see the value added benefits
- Select the faculty to lead the accreditation and write the self study – very important
- Provides degree of independence – bottom up versus top down – faculty own the curriculum
- Constituency input: Faculty, Students, & Industry
- Provides consistency
 - ∞ Prerequisite course content by multiple instructors

Importance of Industry

- Industry support of engineering education in the U. S. is extensive and critically important
 - Provides relevance
 - Through Industrial Advisory Boards
 - Support of senior design projects
 - Support of equipment and facilities
 - Support of undergraduate research projects
 - Support of MS & PhD student research projects
 - Full time, co-op, and internship hiring
 - Mentoring undergraduates

Importance of Industry

- Industry support of engineering education in the U. S. is extensive and critically important
 - Guest speakers in courses
 - Influence with university leaders (dean, provost, and president)
- How to engage industry
 - Alumni at companies
 - Visit company sites – determine their needs
 - Career Fair
 - Invite to campus
 - Department Industry Advisory Boards

Senior Design Project Industry Sponsors: *Over 200 industry sponsors*

○ Examples of Past and Current Sponsors:

General Motors

Ford Motor Co.

Chrysler

Kimberly-Clark

Steelcase Corp.

Stryker Medical

John Deere

Polaris

Robert Bosch Corp.

Caterpillar, Inc.

Dow Automotive

Toyota

Volvo

Bayer Materials Corp

Tyco Safety Products

Precision Edge Surgical Prod.

3M

American Plastics Co.

Nu-Vu Foodservice

Fauerica

Terex Company

Achilles Freedom/Wounded Vets

Cummins

Whirlpool Corp.