

Contact: Diana Gonzalez

**ENGINEERING PROGRAMS ACCREDITATION REPORT**  
**AT THE UNIVERSITY OF IOWA**

**Action Requested:** Receive the accreditation report from the Engineering Programs in the College of Engineering at the University of Iowa.

**Executive Summary:** The College of Engineering offers bachelor of science in engineering degrees in six areas - Biomedical Engineering, Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, and Mechanical Engineering.

All of the programs (1) underwent a self-study that addressed the criteria defined by the accrediting body; and (2) had an on-site visit by peer evaluators. In August 2009, the College of Engineering was informed that three programs (Biomedical Engineering, Civil Engineering, and Electrical Engineering) were accredited for the maximum period. Three programs (Chemical Engineering, Industrial Engineering, and Mechanical Engineering) were initially accredited for a shorter period and they were required to submit an interim report by July 2010. The report satisfied the accrediting requirements and the accrediting body extended the period of accreditation to the maximum period for those three programs.

There were no deficiencies<sup>2</sup> identified for any of the programs in the College of Engineering.

- ◆ The College had an opportunity to address a number of weaknesses<sup>3</sup> and concerns<sup>4</sup> identified for some of the programs soon after the on-site visit and they were resolved before the accrediting agency issued its report in August 2009.
- ◆ Two other weaknesses were resolved following the interim report that the College was required to submit in July 2010.
- ◆ A weakness identified for the Industrial Engineering Program (Program Outcomes) and the Mechanical Engineering Program (Program Outcomes) was reduced to a concern following the interim report submitted in July 2010; the concerns remain unresolved and will need to be addressed in the self-study for the next accreditation visit.
- ◆ Observations<sup>5</sup> were identified for two programs – Civil Engineering and Industrial Engineering.

This report addresses the Board's Strategic Plan priority to provide "educational excellence and impact."

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<sup>2</sup> A deficiency indicates that a criterion, policy, or procedure is not satisfied - the program is not in compliance with the criterion, policy, or procedures.

<sup>3</sup> A weakness indicates that a program lacks the strength of compliance with a criterion, policy, or procedure to ensure that the quality of the program will not be compromised – remedial action is required to strengthen compliance with the criterion, policy, or procedure prior to the next evaluation.

<sup>4</sup> A concern indicates that a program currently satisfied a criterion, policy, or procedure; however, the potential exists for the situation to change such that the criterion, policy, or procedure may not be satisfied.

<sup>5</sup> An observation is a comment or suggestion that does not relate directly to the accreditation action but is offered to assist the institution in its continuing efforts to improve its programs.

**Background:**

- ◇ **Description.** Engineering is the application of science and mathematics to solve problems for society. The University of Iowa offers the following programs:
  - ⇒ **Biomedical Engineering** provides a multidisciplinary education based on a strong engineering foundation. Students may choose between eight focus areas – bioinformatics; bioimaging; biomaterials; cardiovascular biomechanics; musculoskeletal biomechanics; tissue engineering; and pre-medicine. Approximately 300 undergraduate students were enrolled during the program review.
  - ⇒ **Chemical Engineering** emphasizes traditional areas of chemical engineering coupled with eight elective focus areas – biochemical engineering; business; energy and environment; entrepreneurial; polymers; pre-medicine; process engineering; and custom. Approximately 110 undergraduate students were enrolled during the program review.
  - ⇒ **Civil Engineering** has four areas of concentration – environmental engineering; hydraulics and hydrology; structures, mechanics, and materials; and transportation engineering. There were 196 undergraduate students enrolled during the program review.
  - ⇒ **Electrical Engineering** has three tracks – electrical engineering; computer engineering; and information engineering. There were 184 undergraduate students enrolled during the program review.
  - ⇒ **Industrial Engineering** emphasizes the themes of people, problems, and systems; it has six elective focus areas – computers and information systems; entrepreneurship, human factors and ergonomics; management; medical systems; and tailored plan. There were 74 undergraduate students during the program review.
  - ⇒ **Mechanical Engineering** provides expertise in a diversity of focus areas – design; energy and environment; manufacturing and materials processing; management; entrepreneurship; and bio-engineering. There were 280 full-time and 30 part-time undergraduate students during the program review.
- ◇ **Purpose of Accreditation.** An accredited educational program is recognized by its peers as having met national standards for its development and evaluation. To employers, graduate schools, and licensure, certification, and registration boards, graduation from an accredited program signifies adequate preparation for entry into the profession. In fact, many of these groups require graduation from an accredited program as a minimum qualification.
- ◇ **Accrediting Agency.** The accrediting body is the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET).
- ◇ **Review Process.** The self-studies prepared by the Engineering Programs contained the responses to the criteria required by the accrediting body – students; program educational objectives; program outcomes; continuous improvement; curriculum; faculty; facilities; support; and program criteria. The quality standards that programs must meet to be ABET-accredited are set by the ABET professions themselves.

- ◇ On-Site Team Report. In November 2008, the visiting team identified strengths, weaknesses, or concerns for each engineering program reviewed. No deficiencies were noted.
  
- ◇ Sample Institutional Strengths Identified by the Visiting Team.
  - ⇒ “The Science and Technology Library, in addition to providing valuable services as a library, combined with the center building common area provide a very favorable environment for student learning.”
  - ⇒ “The ‘Engineering...and Something More’ initiative with its many supporting programs appears very successful in producing a well rounded engineering graduate.”
  - ⇒ “The College of Engineering Dean provides effective leadership through an inclusive style that is well respected by the faculty, and is an effective communicator on behalf of the College of Engineering to the university administration.”
  
- ◇ Sample Program Strengths Identified by the Visiting Team.
  - ⇒ Biomedical Engineering.
    - 📖 “The program faculty members are sufficient in number to offer a diverse list of elective focus areas and electives.
    - 📖 The core biomedical engineering curriculum not only provides a comprehensive foundation in engineering principles, it also provides a wide range of courses that demonstrate the application of these principles to biological systems.”
  - ⇒ Chemical Engineering.
    - 📖 “Faculty members have a strong commitment to teaching and professional development.
    - 📖 The level of faculty collegiality is high with this cooperation strongly influencing the quality of instruction and the level of collaboration.”
  - ⇒ Civil Engineering.
    - 📖 “A major strength of the program is the quality faculty and the low student to faculty ratio.
    - 📖 The new curriculum, adopted by the College of Engineering faculty in 2001, draws on the broad resources of the university to attract the best and brightest students.
    - 📖 The program is distinguished from others in the region and builds on students wishing to pursue a wide range of career options in engineering including general education beyond technology.”
  - ⇒ Industrial Engineering.
    - 📖 “The faculty members in the program are well qualified with a good mix of industrial and academic experience. The faculty is to be commended for involving a substantial number of undergraduate students in their research work.

📖 Small class size in industrial engineering courses enhances the quality of instruction as faculty members are able to provide special attention to students needing help.

📖 The undergraduate program has a strong component in human factors and ergonomics. The instruction in this area is enhanced by the availability of federally funded driving and flight simulators.”

⇒ Mechanical Engineering.

📖 “The program has a unique collection of focus areas that allow the graduates of the program to gain expertise in areas that prepare them for careers in industry, private practice or continued graduate work.

📖 The faculty is active in research areas that support the educational programs and allow the students opportunities to be engaged in research and benefit from the faculty’s continued development of new techniques and knowledge in the classroom.

📖 The department advisory board is engaged in the program assisting in various capacities including the judging of student projects.”

◇ Program Weaknesses Identified by the Visiting Team.

⇒ Industrial Engineering.

📖 Program Outcomes. “This criterion requires that there must be an assessment and evaluation process that periodically documents and demonstrates the degree to which the program outcomes are attained. The criterion also requires that students demonstrate recognition of the need for, and an ability to engage in life-long learning. Lastly, the criterion requires that students attain a knowledge of contemporary issues.”

*The data presented based on a series of measures appears to be primarily based on student self-assessment which does not provide convincing evidence of student attainment of outcomes.*

**The weakness was unresolved and was a focus of the interim report submitted in July 2010. The weakness was reduced to a concern. The concern remains unresolved.**

⇒ Mechanical Engineering.

📖 Program Outcomes. “This criterion requires that students demonstrate an ability to function on multi-disciplinary teams. Further, this criterion requires an assessment and evaluation process that periodically documents and demonstrates the degree to which the program outcomes are attained. The criterion also requires that students demonstrate recognition of the need for, and an ability to engage in life-long learning. Finally, this criterion requires that students possess knowledge of contemporary issues.”

*The Commission determined that the data presented based on these measures does not provide convincing evidence of student attainment of outcomes.*

**The weakness was unresolved and was a focus of the interim report submitted in July 2010. The weakness was reduced to a concern. The concern remains unresolved.**

◇ Changes Planned or Implemented to Address Weaknesses/Concerns.

⇒ Industrial Engineering.

📖 Faculty developed rubrics to express observable and measurable behavior for the six identified outcomes. An expert in program assessment was hired to assist the faculty in rubric development. Assessment instruments were developed and by Fall 2010 all six rubrics were applied to assess program outcomes. For uniformity and consistency, rubrics for all outcomes will be implemented by the end of the Spring 2011 semester.

⇒ Mechanical Engineering.

📖 Faculty developed and implemented an updated assessment and evaluation process to assess the level of attainment of program outcomes. A rubric that includes four criteria and four levels of achievement was developed and implemented. The level of attainment of the program outcomes will be reviewed at the ABET retreat in August 2011.

◇ Program Observations Identified by the Visiting Team.

⇒ Civil Engineering.

📖 "All of the faculty members that teach classes that are primarily design in content are Professional Engineers. However, nine of the 21 faculty members do not hold a professional engineering license. Professional licensure would add value to the faculty's credentials."

⇒ Industrial Engineering.

📖 "Faculty members have indicated that the current outcome assessment process is very time consuming. For example, a single outcome is being assessed via as many as 30-40 course goals in multiple courses even though some of the goals are only moderately related to an outcome. This entire process could be streamlined."

◇ Accreditation Status. In August 2009, the Engineering Accreditation Commission of ABET awarded accreditation to the Engineering Programs at SUI. The Biomedical Engineering, Civil Engineering, and Electrical Engineering programs received accreditation for the maximum period. The Chemical Engineering, Industrial Engineering, and Mechanical Engineering programs received accreditation for half of the maximum period and were required to submit a report by July 1, 2010 describing the action taken to correct shortcomings identified in the final report from ABET. A follow-up visit was not required for these three programs.

In August 2011, the Commission notified the College of Engineering that the period of accreditation for the Chemical Engineering, Industrial Engineering, and Mechanical Engineering programs was extended to the maximum period.