AC 2011-1453: WHAT DOES THE CIVIL ENGINEERING WORLD LOOK LIKE? LET’S SHOW IT BY THE NUMBERS.

James J O'Brien, Jr, American Society of Civil Engineers
C. Ping Wei, American Society of Civil Engineers
Dion K. Coward, American Society of Civil Engineers

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Civil Engineering Education
Let's show it by the numbers.

Introduction

Every day we all are involved in discussions on the past, current, and future states of our engineering profession. Truths, half-truths, hearsay, and conjecture are all quoted and exchanged as “real” representations of reality. As engineers, we want the most factual information available to make informed decisions. This paper presents the civil and other engineering education enrollment and degree data from 1969 to 2009.

Formal Academic Education

Accreditation

Formal accreditation of engineering programs within the US is conducted by ABET, Inc. ABET is a federation of 30 professional societies with an interest in accreditation of university degree-granting programs. As such, ABET is the recognized accreditor of college and university programs in engineering, technology, applied science, and computing. Further, most licensing jurisdictions within the US consider ABET accreditation as the “gold standard” for formal academic education.

For programs in civil engineering topics, the American Society of Civil Engineers (ASCE) is the Lead Society for ABET’s Engineering Accreditation Commission (EAC). Under ASCE’s Lead Society responsibilities, there are 227 civil engineering programs (226 bachelors and 1 masters programs), 17 architectural engineering programs, 11 construction engineering programs, and three “other” engineering programs. Also under ASCE’s Lead Society responsibilities for ABET’s Technology Accreditation Commission (TAC), there are 55 civil engineering Technology programs, 19 architectural engineering technology programs, 28 construction engineering technology programs, and seven “other” engineering technology programs.

Enrollment Data

All student enrollment and degree information provided in this paper was gathered using survey instruments and interpreted by the Engineering Workforce Commission (EWC) of the American Association of Engineering Societies, Inc (AAES).

1. Undergraduate Engineering Enrollments

As can be seen in Figure 1 (below), civil engineering (includes civil and construction engineering programs) full-time, baccalaureate student enrollment continues on an eight year rise. Although the curve was sinusoidal in shape for 30 years between 1969 and 1999, CEs have witnessed a steady climb in numbers since 1999. This increase in enrollment establishes a record high—the highest since recording was established in 1969. The total, full time, civil engineering student undergraduate enrollment in 2009 was 58,323 students.
Environmental engineering enrollment, while showing a continued very slight increase, remains relatively flat in total enrollments. Mechanical and chemical engineering demonstrate similar increases to civil engineering. In both mechanical and chemical engineering, these student numbers are also record high enrollments (note: for clarity, mechanical engineering data is shown as unfilled/clear diamond shapes). Electrical/electronic engineering, on the other hand, is on a decrease trend line since the late 1980s. Actual total, full time, undergraduate enrollments in 2009 were chemical engineering—31,689; electrical/electronic engineering—53,342; environmental engineering—3,959; and mechanical engineering—90,693.

<table>
<thead>
<tr>
<th>Engineering Field</th>
<th>Enrollments 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Engineering</td>
<td>31,689</td>
</tr>
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<td>Electrical/Electronic</td>
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</tbody>
</table>

![Graph showing undergraduate engineering enrollment from 1969 to 2009](image)
2. Graduate Engineering Enrollments

*Masters Degree Graduate Enrollments*

Examining data through 2009 again shows interesting changes in the graduate student enrollments for engineering disciplines (see Figure 2 below). Civil engineering graduate students (again, including civil and construction engineering) point to the fourth year of increases in students working on masters degrees. Mechanical engineering graduate students follow a parallel increase to civil engineering. Chemical and environmental engineering both have very modest increases in their annual totals. Electrical/electronic engineers, on the other hand, have a drop in their total enrollment from a near historical high in 2008. Total enrollment in programs granting masters degrees in each of the engineering disciplines for 2009 follow: civil engineering—6,725; chemical engineering—1,565; electrical/electronic engineering—14,611; environmental engineering—1,070; and mechanical engineering—8,266.

![MASTER'S ENGINEERING ENROLLMENT (1969-2009)]
PhD Graduate Enrollment

Student enrollments in engineering PhD programs 2009 increased across the disciplines examined (see Figure 3 below). Most showed significant and sustained increases, with environmental engineering demonstrating modest increases. Total enrollment in programs granting PhDs in each of the engineering disciplines for 2009 follow: civil engineering (including civil and construction engineering)—4,072; chemical engineering—5,007; electrical/electronic engineering—12,223; environmental engineering—660; and mechanical engineering—6,716.

DOCTORATE ENGINEERING ENROLLMENT (1969-2009)

(Figure 3)

Degree Data

1. Baccalaureate Degrees
Baccalaureate degrees production in 2009 obviously was influenced by enrollments in the years before the report year for degrees. In addition, students change majors into and out of engineering topics, student move from community colleges into 4 year degree colleges, time to graduation extend beyond four years and many other factors exist to make for actual degree data to differ from previous enrollment data.

In 2009, civil engineering (civil and construction engineering) undergraduate programs followed the previous enrollment trend to award a record number of baccalaureate degrees. Electrical/electronic and mechanical engineering baccalaureate programs graduates fewer students than in previous years. It must be noted, however, that mechanical engineers had a historical high number of degrees awarded in 2008. Chemical engineering programs had a modest increase in degrees awarded in 2009, following a three year slight increase. Environmental engineering programs remained relatively flat in number of baccalaureate degree (see Figure 4 below).

Total number of baccalaureate degrees awarded is: Chemical engineering—5,151; civil engineering—11,274; electrical/electronic engineering—11,978; environmental engineering—507; and mechanical engineering—17,016.

![Bachelor Degrees in Engineering 1975-2009](Figure 4)
2. Graduate Degrees

*Masters Degrees*

Electrical/electronic and civil engineering disciplines had a modest increase in masters degrees awarded in 2009. Chemical, environmental, and mechanical engineering programs were flat or slightly decreased in the number of masters degrees that they granted in 2009. Total masters degrees for 2009 were: chemical engineering—1,113; civil engineering—3,861; electrical/electronic engineering—9,783; environmental engineering—667; and mechanical engineering—4,922 (see Figure 5 below).
Doctorate Degrees

Across all disciplines reviewed, all engineering programs experienced modest to significant decreases to the number of PhDs awarded in 2009. All disciplines examined had historical high numbers of degrees awarded in 2008. Total number of PhDs presented in 2009 was: chemical engineering—867; civil engineering—795; electrical/electronic engineering—1,920; environmental engineering—130; and mechanical engineering—1,173 (see Figure 6 below).

Summary

The future of our civil engineering profession is bright. The number of students enrolled in civil engineering programs and graduating every year continues to rise, offering great excitement for the future. Further work to define the future need for numbers civil engineers remains to be researched. More work, perhaps by surveying individual jurisdiction licensing boards, can be done to determine the total number of unique civil engineering licensees.
References


