Status and Challenges of Engineering Education in Korea

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South Korea

- Population: 48,219,000
- Area: 99,393 km²
- GDP: 14th in the world in 2010
- Global Companies: Samsung, Hyundai, LG, Pohang Steel Co., GS, SK, KT, Doosan, Korean Airline, etc.
- Universities such as Seoul National University, KAIST, POSTECH, Korea University, Yonsei University... (total 325 Universities)
- Internet users: 39,440,000 as of June, 2010, 81.1% of the population
- Percent of college enrollments: 79% of high school graduates, 64% to 4-year colleges in 2010
Educational Structure

<table>
<thead>
<tr>
<th>AGE</th>
<th>Grade</th>
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Ph. D.  6-3-3-4 years

Graduate School
Master
Bachelor
University

High School

Junior High School

Elementary School

Kindergarten

College Scholastic Ability Test

Mandatory

22 month of Military service (mandatory for male)
# Statistics on Education

<table>
<thead>
<tr>
<th></th>
<th>4-year Universities</th>
<th>Junior Colleges</th>
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<tbody>
<tr>
<td><strong>Institutions</strong></td>
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<tr>
<td>Total</td>
<td>179</td>
<td>146</td>
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<tr>
<td><strong>Students</strong></td>
<td></td>
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<tr>
<td>Total</td>
<td>1,359,000</td>
<td>489,000</td>
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<tr>
<td>Engineering</td>
<td>317,000</td>
<td>92,000</td>
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<td><strong>Graduates</strong></td>
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<tr>
<td>Total</td>
<td>279,000</td>
<td>199,000</td>
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<tr>
<td>Engineering</td>
<td>65,000</td>
<td>40,000</td>
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<td><strong>Number of Professors</strong></td>
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<tr>
<td>Total</td>
<td>54,500</td>
<td>12,500</td>
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<tr>
<td>Engineering</td>
<td>11,000</td>
<td>3,300</td>
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<td><strong>Employment Rate</strong></td>
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<tr>
<td>Total</td>
<td>60.7%</td>
<td>81.5%</td>
</tr>
<tr>
<td>Engineering</td>
<td>61.4%</td>
<td>93.2%</td>
</tr>
</tbody>
</table>

Source: Statistical Yearbook of Education, 2009
Women in Engineering

Female Student Ratio

% Females

1999 2001 2003 2005 2007 2009

16.4 18.3 19.6 20.1 18.4 17.3 18.1 17.7 17.8 18.1 18.3

Female Faculty Ratio

% Females

2005 2006 2007 2008 2009

2.9 3.2 3.4 3.6 3.8

Korea Advanced Institute of Women in Science, Engineering, and Technology
Challenges in Engineering Education

Perceived Challenges by Academia

- Recruiting and retaining top students
  - Top students prefer medical school, law school, etc., causing engineering “brain-drain”
  - Decrease in population will make the situation tougher.

- High school science curriculum and teaching pedagogy
  - Not enough science subjects are offered
  - Chemistry and physics are electives and avoided by majority of students
  - Rote learning is practiced, preparing for college entrance exam.

- Research-emphasized faculty evaluation system
  - Research is emphasized regardless of each college’s research infrastructure and capability
  - And yet, the teaching load in most universities is heavy. Over 10 lecture hours/week is common, and class size often over 50.
Perceived Challenges by Students

- Curriculum is designed to give the basics of each field, but not enough to get in-depth and/or broad knowledge of the field.
  - Not enough electives are offered
- Fast-paced lectures and heavy assignment load
- Lack of guidance for career development by faculty members
- Lack of opportunities for hands-on experience and research
  - Low quality lectures and equipments for undergraduate laboratory
- Accreditation: Despite the difficulties of fulfilling the requirements, there are few short-term benefits such as better employment opportunities
- Social status of engineers are not on par with other industrialized countries.
  - Engineers are not distinguished from scientists, even in the industry
  - Engineers are not getting the level of recognition deserved despite their huge contribution to Korean economic growth.
Perceived Challenges by Industry

- **Recruiting top students to industry**
  - Top students move on to medical schools, law schools, finance, and other professions after graduating with engineering degree
  - Top students prefer teaching and research organizations, e.g., universities, national labs
  - These trends worsened after massive lay-off of engineers in 1998 during national financial crises.

- **Training a new engineer to be self-sufficient** takes an average of 3 years

- **Mismatch of supply and demand in different fields of engineering and levels of skills**
  - Lack of IT engineers vs. overflow of engineers in conventional fields

- **Engineering curriculum**
  - Insufficient up-to-date industrial examples in course materials
On-going programs
Accreditation of Engineering Program

- Accreditation Board for Engineering Education in Korea (ABEEK) was formed in 1998. Accreditation began in 2001
  - Vision: Quality improvement in engineering education through accreditation
- ABEEK is a full signatory of the Washington Accord, and a provisional member of the Sydney Accord and the Dublin Accord
- ABEEK played a key role in establishing the Seoul Accord for the computing and IT-related education at the tertiary level.
- As of March, 2011, 616 programs in 89 universities (EAC : 551, CAC : 32, TAC : 33) have been accredited.
CRITERIA FOR ACCREDITING ENGINEERING PROGRAMS

- 12 required program outcomes
  - Similar to the 11 Washington Accord outcomes
  - Additional outcome: an understanding of other cultures and an ability to engage in international cooperation

- Curriculum
  - Minimum of 30 credits of college level mathematics, basic sciences and computing.
  - Minimum of 60 credits of engineering topics including 18 credits of engineering design appropriate to student’s field of study.
  - Minimum of 18 credits of complementary studies designated for the attainment of the educational objectives of the program.
Government Sponsored Programs

- **Innovation Center for Engineering Education**
  - Funded 50 centers in engineering colleges across Korea in 2007
  - Main objectives:
    - To enhance each university’s engineering educational programs to meet the needs of the industries in the region
    - To seek a continuing collaboration with the industry on development of relevant educational contents.

- **Women in Engineering Program**
  - Funded 5 universities across Korea in 2006
  - Main objectives:
    - To promote more inclusive educational class environment for female engineering students
    - To develop specialized programs for women engineers to be more competitive in the job market (e.g. leadership, machine handling skills etc.)
    - To support employment in the field.
Industry Sponsored Programs

- **Samsung Talent program**
  - Started in 2006 as Samsung Electronics Information and Communications track. Started its 2nd phase in 2011. Programs in EE&CS, Materials Sciences and Engineering, and Mechanical Engineering at 14 universities
  - Program details vary: An example in EE at Hongik University.
    - Two tracks: Semi-conductors and Communications
    - Students take 10 required subjects and 3 out of 10 electives.
    - Students get internship opportunities and preference in employment. Some receive scholarships.

- **Display Track**
  - Co-sponsored by display industries and government
  - Interdisciplinary program. For example EE, Materials Sciences & Engineering and Chemical Engineering
    - Students take 16 credits (5-6 subjects) of display related subjects
Korean Society of Engineering Education (KSEE)

- Founded in 1993
- 3000 members from Academia and Industry

Main Activities

- Publications: Journal of Engineering Education Research, Engineering Education (bimonthly magazine), Proceedings, research reports...
- Engineering Education Information Center
- Engineering Education Workshops
- International exchange with ASEE, JSEE, AEESEAP, IFEES, and ACEE.
- Annual Conference in November
You are cordially invited!
Date: Nov. 24 - 25, 2011
Place: The Shilla Jeju