APRIL 2007

CONNECTIONS

VOLUME 1: ISSUE 2

Issue Topic:

Studying Engineering In the USA

EducationUSA

Supported by the U.S. Department of State

education USA
CONNECTIONS

VOLUME 1: ISSUE 2: APRIL 2007

In This Issue:

Studying Engineering in the USA

Note from the Editor:

This issue is devoted entirely to engineering, one of the most popular fields of study chosen by international students in the United States. Offering perspectives from engineering faculty, admissions counselors, researchers, advisers, and students themselves, these articles are intended to assist you in advising international engineering students.

Specifically, Margery Berti, Dean at the University of Southern California's Viterbi School of Engineering, discusses how the field of engineering has undergone fundamental changes due to globalization and technological advances and outlines specific features students should look for when selecting an engineering school. International students, from Mexico to Sri Lanka, share their experiences in American engineering programs. Special thanks to Nancy Keteku, REAC-Africa, who not only contributed several articles, but also provided expert guidance and engineering knowledge to shape this issue.

We are delighted to present the new Connections portal on the IIENetwork website: **http://educationusaconnections.iienetwork.org**. Here you will find an archive of the past issues of Connections and additional advising resources. To complement this issue, you will find three additional field-specific engineering fact sheets for incoming graduate students (like those on p. 11 & 12 in this issue) prepared by IIE's Placement Division.

I would like to thank all the advisers and REACs who contacted students for this issue, as well as those of you who responded to the online survey. Your feedback guided the content of this second issue. Please continue to contact me with your suggestions for future issues.

– Shannon Bishop, Managing Editor, *Connections*
Program Manager, Institute of International Education
sbishop@iie.org

Features

Departments

Current Trends in Engineering: A Dean's Perspective

By Margery Berti

Feature

Never has engineering played a more crucial role in shaping society, culture and life itself than it does today. At the same time, the profession is undergoing a fundamental transformation fueled by tremendous technological advances. The signs are everywhere.

USC Viterbi School of Engineering Career Fair.

New York Times columnist Thomas Friedman states in his book, *The World Is Flat: A Brief History of the Twenty-first Century*, that the playing field has been leveled across the globe. The anywhere-anytime access to information enables emerging economies to challenge the U.S. in areas of traditional dominance. Rising economies in the former third world put increasing pressures on natural resources, human capital, wages and the global environment.

The National Academy of Engineering (NAE) report *The Engineer of 2020* advises that, among other things, engineers must anticipate the future; must be communicators, decision makers, and entrepreneurs; must address ethical and social issues; and must play a greater role in determining public policy. Engineers of the future must perform with ambidextrous analytical and creative skills, that is, with a seamless blending of "left-brain" and "right-brain" skills.

Engineering educators in the U.S. are pondering what all this means. After all, they are preparing tomorrow's engineers to recognize and meet these profound changes.

International students, and those advising them about graduate engineering study in the U.S., would do well to consider these trends. In addition to the traditional measures of excellence, other features like agility, innovation and interdisciplinarity make engineering schools desirable today. Following are some areas that students and advisers should consider as they evaluate engineering school choices.

Academic programs

The most important consideration in choosing where to apply for graduate study in engineering is which school best serves the individual student and provides a high quality education. Another important factor is flexibility. If a student wants to take courses in the major in addition to courses in related areas, he or she should look for a program with leeway. If the student enters a Master's program and wants to decide later whether to stop there or continue for the Ph.D., he or she needs a program that allows either option. Innovative degree programs and options within degree programs are highly desirable, and they demonstrate agility. When engineering schools introduce new programs and variations on older programs, as they often do in connection with new interdisciplinary research centers, it is a sign to prospective students that the school is looking forward and not standing still. This usually translates to more job offers upon graduation.

Faculty

A school's faculty is its foundation and its essence. Constantly improving its quality, through the recruitment of outstanding young and prominent senior faculty in key areas, must be a school's highest priority. Prospective students should look for a school whose faculty thrives and excels.

Some indicators of excellence in the U.S. include: the number of faculty who have been elected membership in the National Academies;

CONTINUED FROM PAGE 2

number of faculty who are Fellows of their professional societies (IEEE, ACM, ASME, etc.); faculty who have earned Presidential Early Career, Presidential Young Investigator or NSF/NIH Young Investigator awards; success of faculty in competing for national research centers; volume of research expenditures by faculty; publications; and faculty support for interdisciplinary research centers.

USC Engineering student participates in spring Career Fair.

Meeting societal needs

Universities are a major force in addressing critical issues facing society and creating new opportunities. As we move further into the 21st century, society will increasingly value universities actively engaged in addressing issues of practical societal importance. We already see this happening with regard to trends in extramural funding, higher education policy, and student goals. Engineering schools with interdisciplinary engineering centers have broad societal impact in this area, and aim to develop technologies to ease human disabilities, promote learning, and improve security and human welfare.

Interdisciplinary centers

Since societal problems rarely fall within the domain of a single discipline or school, such problems are best addressed by collaboration that brings together different perspectives and skills. Prominent examples of interdisciplinary research today are biotechnology, nanotechnology and high-performance computing. Disciplinary and school boundaries can impede effective collaboration so an engineering program must create mechanisms that remove structural disincentives to such collective efforts on problems of major significance. A highly interdisciplinary research environment enables faculty to respond to emerging needs for research in such diverse areas as robotics, software engineering, sensor networks, vision sciences, automated construction, and photonics.

Internationalization – Building Networks and Partnerships

The convergence of globalism, technology, and education requires leading engineering programs to become truly international in presence, focus, and scope. Solving critical problems in society depends on recognizing and developing the deep connections between "us" and the world, rather than dwelling on the differences.

Leading engineering schools are making internationalization one of the central themes of their strategic plan. They seek high-quality partners abroad for partnerships and exchanges. They are forging relationships that include exchanges of faculty and students and research collaboration going in both directions. This goes to the advantage of both the students and the sponsoring programs. Global visibility attracts the most talented students and scholars in the world.

Beyond the classroom

Engineering programs should enrich the lives of their students outside of the classroom. Students need opportunities to interact with peers, including those from other disciplines, for social, recreational and cultural activities. Student organizations should be active. Schools should encourage internships and provide career services to help students find employment so that they can take advantage of curricular practical training and optional practical training experiences. One should also look at how connected an engineering school is to the larger community surrounding it through service learning and community relations programs. In addition to meeting community needs, these programs provide students with the opportunity to apply their new skills to real-world problems.

International students are also advised to consider whether the engineering school is part of an institution with a history of successfully serving international students, where they are welcomed into the larger community and their special needs are well understood.

CONTINUED FROM PAGE 3

Engineering student enjoys E-Week (Engineering Week) joisting competition.

Core values

Engineering schools take their cues from their institution's leadership when it comes to their core values. Prospective students should be able to find a statement of an institution's core values in its strategic plan or mission statement. The institution ought to promote free inquiry. It should be committed to searching for truth and defending it. It should maintain standards of community, including caring and respect for one another as individuals; appreciation of diversity; strong alumni networks; and a commitment to service. It must require ethical behavior and be guided by principles of academic integrity.

The demand for education is increasing worldwide, and the best students will view higher education as an international market, heightening competition among higher education providers worldwide. In order to attract high quality students, engineering schools must offer innovative degree programs; encourage path-breaking research; aggressively pursue external funding opportunities; ask and answer important questions that push the boundaries of human knowledge; accelerate excellence under evolving external circumstances; and stimulate in their students those qualities of scholarship, leadership and character that mark the true academic and professional engineer.

***Margery Berti** is Associate Dean at the Viterbi School of Engineering at the University of Southern California.*

— USC Core Documents are the source for some material in this article.

Online Resources for Engineering

The Accreditation Board for Engineering and Technology (ABET)
ABET is the recognized U.S. accreditor of college and university programs in applied science, computing, engineering, and technology.
www.abet.org

American Society for Engineering Education
A nonprofit organization of individuals and institutions committed to furthering education in engineering and engineering technology. They have two magazines, one a peer-reviewed academic journal, the other a consumer-oriented publication, called Prism **(www.prism-magazine.org).**
www.asee.org

EWeek
Engineering Week took place from February 18-24. Visit this site to learn ways to promote engineering in your Center.
www.eweek.org

Funding for US Study
A directory listing funding opportunites for all degree levels—undergraduate, graduate, postgraduate—available through a range of institutions including colleges and universities, educational associations, foundations, and other organizations. The searchable database allows you to search specifically by engineering field.
www.fundingusstudy.org

The National Council of Examiners for Engineering and Surveying (NCEES)
A national non-profit organization composed of engineering and surveying licensing boards representing all states and U.S. territories.
www.ncees.org

National Society of Professional Engineers
A resource for both high school and college students seeking information about engineering and the role engineers play in our society.
www.nspe.org/students/home.asp

Society of Women Engineers
SWE empowers women to succeed and advance in those aspirations and be recognized for their life-changing contributions and achievements as engineers and leaders.
www.swe.org

U.S. Department of Labor, Bureau of Labor Statistics Occupational Outlook Handbook
Provides an overview of the field of engineering, including the nature of the work, training, employment opportunities, related occupations, etc.
www.bls.gov/oco/ocos027.htm

Engineering 101: Frequently Asked Questions

By Nancy Keteku and Catrillia Young

Feature

Engineering, because of its technical nature, numerous subsidies, and diverse program offerings, often proves a challenging field to thoroughly explain to potential students. This article offers a crash course in the field of engineering at the undergraduate and graduate level, providing answers to the most frequently asked questions.

Q. What degree options are available in Engineering?

A. While some future engineers attend undergraduate institutions offering a Bachelor of Engineering, other B. Eng students, such as those at liberal arts schools, may major in mathematics or a physical science and receive a Bachelor of Science. Schools that do not have specific engineering programs will often have "engineering advisors" available to help guide students' course of study to ensure they take the prerequisites needed for graduate school. Many of the science and math requirements for graduate school must be taken in sequence, so it is important for future engineers to select their courses strategically. Some students, after receiving an undergraduate degree, go on to take a professional exam to get a license in their particular fields. In the United States, this type of license is regulated by individual states. You can visit the National Society of Professional Engineers (**www.nspe.org**) for more information.

Some schools offer 2 or 4 year degrees in Engineering Technology, which prepare students for practical design and production work. Graduates of these programs are generally thought to have skill levels between those of a technician and an engineer and are not qualified to register as professional engineers like those who graduate with B.S. or B.Eng degrees.

Students who would like to pursue graduate work in engineering would likely look for a Master's of Science or Ph.D. program. These degrees are for students that are interested in specializing in a specific subfield, learning new technology, or performing quantitative research. Master's and Ph.D. programs in engineering generally take 2-7 years to complete after an undergraduate degree and require a thesis paper or dissertation.

Q. What are the different types of Engineering specializations?

A. An Engineering degree provides students with the opportunity to apply their skills to a variety of disciplines within the context of engineering. According to U.S. Department of Labor, Bureau of Labor Statistics' *Occupational Outlook Handbook*, the most popular fields of engineering include electrical, electronic, mechanical and civil. In recent years, students have increasingly pursued degrees in architectural, biomedical and computer engineering.

Q. What do admissions counselors look for in an applicant?

A. Since there are no set admissions criteria, it can be tricky to figure out what admissions officers are looking for in engineering applicants. When reviewing admissions applications for undergraduates interested in engineering, admissions counselors look

Finding Accredited Engineering Programs in the U.S.

The Accreditation Board for Engineering and Technology (ABET) is the recognized accreditor for college and university programs in applied science, computing, engineering, and technology. Go to www.abet.org and click on 'search accredited programs', where you will find colleges and universities accredited by ABET. The link www.abet.org/schoolalleac.asp will take you directly to a list of accredited engineering programs. While many students will want to search for programs in their desired engineering field, bear in mind that some of the most respected universities in the U.S. offer simply "engineering" degree programs that are not broken down into departments such as electrical, civil, chemical, or mechanical.

CONTINUED FROM PAGE 5

to see whether the student has taken and excelled in courses that are key factors in engineering, in addition to having performed well in other disciplines. It does not reflect well to have high grades only in the subjects that apply to engineering, such as math, physics and chemistry, and poor grades in other classes. Admissions counselors also look favorably upon students who express their thoughts clearly and logically in writing. Solid writing skills are crucial not only for engineering studies but also for the workplace.

Q. Is it possible to gain admission to a Master's degree program in Engineering if I didn't study Engineering at the undergraduate level?

A. Yes, it is possible, but it depends on how closely your undergraduate study relates to your graduate study interests. Students with strong undergraduate foundations in mathematics, physics, chemistry, biology, computer science or geosciences may seek admission to graduate programs in closely related fields. For example, an undergraduate math major with demonstrated computer skills could apply to graduate programs in computer engineering, or an undergraduate biology major could be admitted to graduate programs in biotechnical engineering. Physics best prepares students to move into engineering.

In many cases, students are required to take 'bridge courses'–undergraduate-level engineering classes–before starting graduate school. An example of this would be Fluid Dynamics for a chemistry major switching to chemical engineering. Another approach is to enroll for a U.S. Master's degree in the same field as the undergraduate study, setting the stage for the transition into Engineering at the doctoral level.

Students seeking to switch fields must be able to explain clearly how engineering fits into their career plans. Students must also bear in mind that they will not be eligible for graduate assistantships while they are in the 'bridge' phase.

Q. What about 3-2 Engineering programs? How do they work, and what are the financial aid options?

A. In 3-2 programs, students are initially admitted to an undergraduate liberal arts college that does not offer engineering. Many of these colleges offer generous financial aid to international students; hence their attraction. Students spend their first three years at the liberal arts college, building their foundation in the arts and sciences and majoring in physics (or sometimes other fields), and planning their course selection carefully with their engineering advisor. They then transfer to a partner university that has a 3-2 agreement with their college, where they spend two years majoring in a chosen engineering field. After a total of five years, they graduate with two bachelor's degrees: one from the liberal arts college and one from the engineering university. Examples of successful 3-2 programs for international students: Oberlin to Columbia, Bryn Mawr to Cal Tech, Grinnell to Washington University.

Another type of dual-school program involves consortia that have agreements with partner institutions in which the first school's financial aid carries over to the engineering school. Examples of these agreements include: Vassar to Dartmouth on the Twelve College Exchange; Mount Holyoke to University of Massachusetts on the Five College Program; Morehouse and Spelman to Georgia Tech on the Atlanta Consortium.

The key to 3-2 or consortia programs for financially-needy international students is researching the financial aid of both partner schools. Students must research carefully before they start the application process, so that they do not get stranded without funds when they seek to transfer, and they must work closely with their 3-2 program advisors to plan their courses and ensure they are competitive for admission.

---

*By **Nancy Keteku**, REAC-Africa based in Ghana and **Catrillia Young**, Assistant Director of International Student Services at the State University of New York, Plattsburgh.*

The Challenges of Financing Engineering Education

By Nancy Keteku

Feature

Finding funding for engineering studies can be challenging – but not impossible. Many foundations, organizations, and associations offer financial aid, in addition to scholarships or tuition reduction that are available directly from the campuses. Below, you will find a summary of ideas and tips to help find funding for engineering studies in the U.S. for both undergraduate and graduate students.

Undergraduate Students

According to ABET (Accreditation Board for Engineering and Technology), over 350 U.S. colleges and universities offer Bachelor's degrees in various engineering fields, and over 73,000 new engineers graduate each year. This tells us that opportunities are plentiful for aspiring engineers. But how can international students finance their engineering dreams?

The keys to success are the same for engineers as for everyone else: research and enhancement. Students must research very thoroughly to identify the universities that are accredited by ABET to offer the engineering degrees that interest them, and then to find out which universities award financial aid to international students. But students shouldn't stop there! Encourage them to conduct further research to find out the comprehensive annual cost of attending each university, and how much financial aid each one awards. Future engineers can then put their mathematical minds to work, strategically calculating which universities will give them the best chances of admission with financial aid. Before launching their research, students must discuss with their families how much they can afford to spend for each of the four years of their undergraduate education, in order to calculate how they can meet costs that are not covered by financial aid.

The College Board's *International Student Handbook* lists the comprehensive annual cost of attendance for international students, and provides financial aid information as well. It is important to use the most current edition of the "ISH" in order to get accurate figures. Advisors should give students the "financial aid list", available on the advisors' resources section of the EducationUSA website, which features nearly seven hundred U.S. colleges and universities that award more than $10,000 in average financial aid to international students. Look for the letter (E) next to the names of 155 colleges and universities that are ABET-accredited in engineering and offer generous financial aid to international students. Out of these 155 institutions, at least 25 are able to provide full funding covering all educational costs, targeted at students whose families cannot afford to pay significant amounts.

The bottom line? The U.S. offers the world's best opportunities for engineers. Students should not be discouraged by the challenges of applying for financial aid: U.S. colleges and universities award millions of dollars to international engineering students, and they're looking for students with big ideas.

The Admissions Crunch

Academically qualified students who can pay the entire cost of their education will find the admissions process relatively smooth, but those who need financial aid will meet keen competition. Thousands of would-be engineers from all over the world are competing for limited funds, and the universities that offer financial aid attract the most applicants. This is why we advise enhancement, to strengthen the application in every way possible.

Graduate Students

Financing graduate study in engineering is the same as any other research-oriented science field: students must be able to articulate precisely what they are interested in researching, demonstrate current knowledge of their area of study, and identify professors who are working in areas of their interest. Then they must establish communication with those professors, and convince them to take them on as graduate students. Communication with professors is the key to getting funding for graduate study.

In engineering, professors often delay offering assistantships to graduate students until after they have enrolled at the university and demonstrated their research skills. For this reason, it is advantageous to be able to finance the first semester or the first year of graduate study in engineering.

Graduate engineering students frequently finance their first year through teaching assistantships in another field, such as mathematics, chemistry, or physics, where the demand for teachers of undergraduates is higher. Students should explore this opportunity. Information on financing graduate studies is also available on the advisors' section of the EducationUSA website.

Nancy W. Keteku *is REAC-Africa based in Accra, Ghana.*

Tell It Like It Is

Feature

Nobody knows better than international students themselves what it's like to study engineering in the United States. Collected by advisers and REACs, the comments below feature feedback from engineering students of various nationalities. Studying in various U.S. Engineering programs, these students share their tips and firsthand experiences.

Q. What surprised you most about engineering programs in the U.S?

"The engineering programs here are very hands on and focus on getting you accustomed to real world problems. The courses concentrate on explaining concepts rather than making you memorize material. Additionally, they mandate engineering students take liberal studies courses to provide them with a well-rounded education. Many engineering programs have interdisciplinary components as well."

-Sujith Vidanapathirana, Sri Lanka
Computer Science (Engineering Department), Cornell University

"The most noticeable aspect of U.S. education is its emphasis on self-study and inquiry. A student is expected to study and research by himself to gain in-depth knowledge. Professors just act as a support system during your study."

- Aravind Bommakanti, India
MS in Computer Science, New Mexico State University

"I expected engineering to be more practical, with more real-world projects right from the beginning. I wanted to get into the lab and make things. Instead, my studies turned out to be largely theoretical. Prospective engineers should carefully study the curriculum of each school they apply to, look at opportunities to do practical projects, and find out how early they are expected to specialize."

- Ghanaian undergraduate student
Electrical Engineering, Yale University

"I was surprised by the great help we get from professors and teaching assistants. They are all willing to go an extra mile to help students out."

- Getrude Chimhungwe, Zimbabwe
Dual degree in Chemistry and Chemical Engineering with Mount Holyoke College and University of Massachusetts at Amherst

Q. What do you wish you knew before you entered your engineering program in the U.S.?

"I forgot quite a lot of things that I studied in class 12. The reason is simple; the gap between March and August made me forget much of what I had studied. I should have reviewed my course material over the holiday."

-Naman Chopra, India
Computer Engineering (BS), Purdue University

"I wish I could have taken a little bit more time improving my MATLAB's skills. Engineering programs in the U.S. emphasize the development of programming skills that facilitate visualization and analysis of the solving of engineering problems. P-SPICE for Electrical Engineers or Solid Works for Mechanical Engineers is a must."

-Erick Ulin-Avila, Mexico
Nanotechnology (Ph.D), UC Berkeley

"I wasn't quite ready for weekly assessments, biweekly tests, and all the other work. Finals, which accounted for 100% of our grade back home, suddenly counted for only 30% of the grade. In the beginning, I put all my effort into these weekly tests (because that was the only way I knew) and as a result, got exhausted and crashed towards the end of the semester. I learned that trying to get a perfect score in these tests is the worst thing you can do because the scores only accounted for a small a percentage of the final grade."

-Dilan Jayawardane, Sri Lanka
Computer Science, MIT

CONTINUED FROM PAGE 8

Q. Do you have any advice for students about to enter or apply to engineering programs in the U.S.?

"Many schools have placement exams, which students have to take even before the first semester starts. Students who perform well on these exams are able to waive certain prerequisite courses that they've already taken as an undergrad. Even at schools where such exams are not administered, it helps to study the information in the pre-requisite courses before entering your program. Students will have a hard time if their basics are shaky, and this can have an undesirable impact on their performance and confidence."

-Ajay Ravindra, Bangalore
Electrical and Computer Engineering (MS),
University of Southern California

"When choosing a program, students should consider departmental ranking in addition to university ranking. Investigate the department, staff, and the research opportunities very carefully. In some cases, a department in a university without a high ranking may have strong infrastructure and staff. Or, the other way around, a university may have a high ranking, but the department may not."

- Elif Saroglu Sertel, Turkey
Visiting Student Researcher in Environmental Sciences,
Rutgers University

"When you apply, research the university well, look out for engineering programs that the university specializes in. Whether it's robotics or semiconductors, students should express their willingness to be a part of that program and mention specifics. If you show interest in the Engineering department you are applying to, they will surely show interest in you."

-Kishan Ellepola, Sri Lanka
Electrical Engineering (BS), Drexel University

"I would advise future students to select their adviser carefully, depending on their interests and style of working. The direction of someone who can see the big picture is really important in order to pursue the right educational path. Secondly, motivation and collaboration are very important in the graduate study, and these are directly related to your adviser. Additionally, students have a chance to collaborate with the adviser's other students who are generally more experienced."

- Yusuf Aytar, Turkey
Computer Science (MS), University of Central Florida

Did You Know?

National Science Foundation:

Data on International Engineering Students

A new report from the National Science Foundation provides data on engineering degrees earned by international students:

2005 Bachelor's degrees:

International students were awarded 7.4%, or 5,644, of the Bachelor's degrees in engineering in the U.S.

2004 Master's degrees:

International students were awarded 46.1%, or 15,620, of the Master's degrees in engineering in the U.S.

2005 Doctoral degrees:

International students were awarded 57.2%, or 3,302, of the Doctoral degrees in engineering in the U.S.

For more detailed information on the National Science Foundation's Report, please visit:

http://www.nsf.gov/statistics/wmpd/underdeg.htm
http://www.nsf.gov/statistics/wmpd/graddeg.htm

Studying Engineering in the U.S.: Overview and Trends from the *Open Doors* Survey

By Patricia Chow

Research

Engineering continues to be one of the most popular fields of study chosen by international students in the U.S. ranking # 2 after Business and Management. In 2005/06, 16 percent of all international students, were studying engineering (including engineering-related fields) at U.S. colleges and universities, despite a small drop in the percentage. Only business & management accounted for a larger share of the international student body (18 percent).

While the vast majority of students interested in engineering-related topics are enrolled in the primary field of engineering (94 percent), related sub-fields within engineering include: engineering technologies, which support engineering and engineering-related projects; transportation and materials moving, including aeronautics and aviation; mechanic and repair technologies, including industrial and electronic maintenance; construction trades; and precision production. (See the National Center for Education Statistics' *Classification of Instructional Programs at* **http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2002165** for a complete description of the various fields of study).

Engineering is a much more popular field of study among international students at the graduate level than for undergraduate international students. In 2005/06, 23 percent of international graduate students in the U.S. were studying engineering, while only 11 percent of international undergraduates chose to study this field.

The popularity of engineering as a field of study also varies according to the type of institution attended. In 2005/06, 23 percent of international students enrolled at doctoral/research institutions chose to study engineering, compared to 9 percent of those at master's institutions, 5 percent of those at associate's institutions, and only 2 percent at baccalaureate institutions.

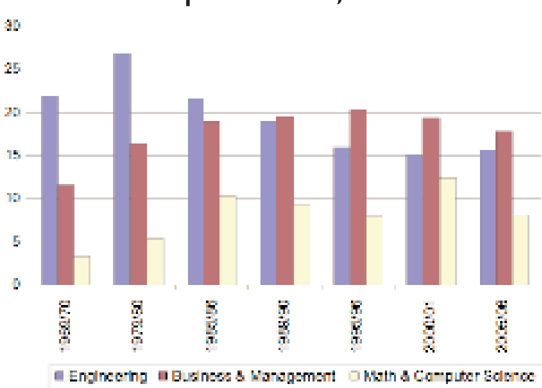
While *Open Doors* no longer collects data correlating international students' fields of study with their country of origin, past trends are presented in the figure below. The figure reveals an interesting shift: while in 1979/80 almost half of all international students in engineering came from the Middle East, in 1985/86 close to 50 percent of all international engineering students were from Asia. During this time, the total number of students from the Middle East decreased significantly, while the total number of students from Asia almost doubled.

In contrast to the circular graphic, the bar graph below shows the proportion of international students from each world region that studied engineering vs. other fields in 1969/70, 1979/80 and 1989/90. In all three years, the Middle East had the highest proportion of students studying engineering. Students from North America and Oceania were least likely to pursue engineering studies in the U.S.

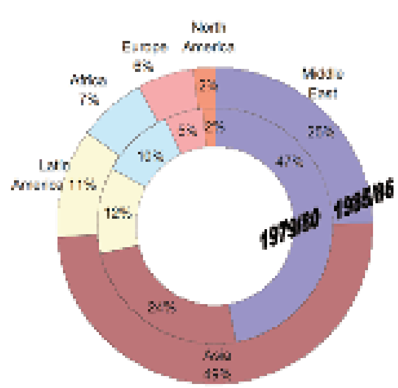
More detailed information, including data tables for all fields of study from this year's *Open Doors* publication, is available at **http://opendoors.iienetwork.org/**. To access data tables available only to members, log in using the word "adviser" for both the username and password.

***Patricia Chow** is a Research Officer with the Institute of International Education.*

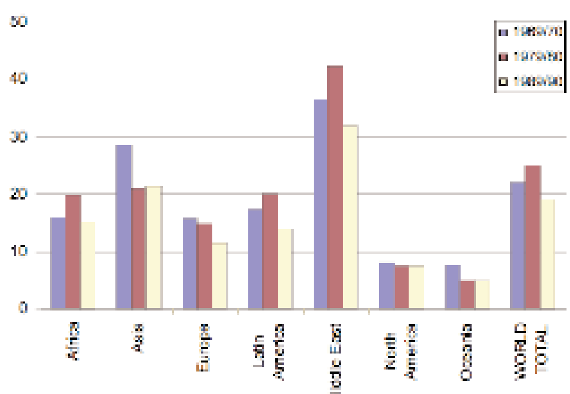
Percentage of International Students Studying Engineering, Business & Management, and Math & Computer Science, Selected Years



Region of Origin of Engineering Students



Percentage of Students Studying Engineering by World Region



Electrical Engineering – Graduate

General Description:

Electrical Engineering is the practical applications of the theory of electricity. This is the branch of engineering science that studies the uses of electricity and the equipment for power generation and distribution and the control of machines and communication.

Common Specializations	
Bioengineering	Bioengineering is concerned with the application of engineering principles to the study of biological processes.
Computer Engineering	The field of computer engineering is centered in digital design, computer architecture and computer applications, i.e., circuits and devices, computer systems, and engineering software.
Digital Signal Processing	Digital Signal Processing is the representation of signals in digital form and the transformation of such signal representations using digital computation.
Electric Power	Electric Power is primarily concerned with meeting the future demand of electrical energy while satisfying environmental constraints.
Electronic Design and Applications	This specialization includes device and integrated circuit fabrication, and circuit and system design and simulation.
Microelectronics/ Microsystems	Microelectronics is concerned with the design, analysis, growth, and fabrication of micron/submicron feature length devices.
Systems and Controls	Systems and controls is concerned with mathematical and computation techniques for modeling, estimation, and control of systems and processes
Telecommunications	Encompasses the characterization, representation, transmission, storage and networking of information over various media including space, optical fiber, and cable.

Common Degrees	
MEng	The MEng is a professional degree. This degree can usually be completed in 1 year and does not require a thesis.
M.S	There are usually 2 options for the Master of Science degree. Thesis and non thesis. The non thesis option requires more credits to complete the degree
PhD	Highest degree. Typically a 5 year program beginning with coursework followed by a dissertation composed of original research.

Special Notes on Applying:

Detailed letters of recommendation from faculty/employer who can attest to the student's qualifications are important.

A well written study objective focused on the candidate's specialization is essential.

Special tips for visiting student researchers: It is important to identify the faculty person in the US that you would like to work.

Admission Requirements	
Admission and Financial deadlines	Deadlines tend to be early beginning December 15 through January 15.
Academic background	Students applying to the Masters or PhD program must have an undergraduate or graduate degree in Engineering.
Work experience	Research and/or work experience is advantageous, but not necessary.
Tests	A TOEFL score of 575 is required. GRE scores in the 90% are essential, especially in Math.

Source: This information is based on internal materials produced by IIE and resources readily accessible on the internet.

Visit: http://educationusaconnections.iienetwork.org to find additional fact sheets in the field of Engineering

Mechanical Engineering – Graduate

General Description:

Mechanical Engineering is the branch of engineering that deals with the design, construction and operation of machinery. Mechanical engineers use principles such as heat, force, and the conservation of mass and energy to analyze static and dynamic physical systems.

Common Specializations	
Mechatronics	Mechatronics is the fusion of Electrical and Mechanical disciplines in modern engineering
Thermal-Fluid Sciences	Thermal-Fluid Sciences includes computational fluid dynamics, experimental techniques, optical thermal sensing and laser diagnostics applied to the investigation of sprays, droplet deposition and combustion.
Acoustic/ Vibrations	This area of research deals with the engineering of sound and vibration. Applied research may involve the development of aircrafts and automotive brakes, jet engine turbine blades, components in power drive trains, and advanced manufacturing methods.
Design & Manufacturing	This specialization focuses on design theory, methods, and practice. Stochastic optimization techniques are used to develop design tools for product layout.
Solid Mechanics	Solid Mechanics addresses issues related to impact resistance and notch sensitivity of gas turbine materials, residual stresses and deformation in solid free form fabrication techniques, and the mechanics of thin bonded films and coatings.
Common Degrees	
MEng	The MEng is a professional degree. This degree can usually be completed in 1 year and does not require a thesis.
MS	There are usually 2 options for the Masters of Science degree. Thesis and non thesis. The non thesis option usually requires more credits to complete the degree.
PhD	Highest degree. Typically a 5 year program beginning with coursework followed by a dissertation composed of original research

Special Notes on Applying:

Detailed letters of recommendation from faculty/employer who can attest to the student's qualifications are important.

A well written study objective focused on the candidate's specialization is essential.

Special tips for visiting student researchers:

It is important for the candidate to identify the faculty person in the U.S. that he/she would like to work under.

Admission Requirements	
Admission and financial aid deadlines	Deadlines begin as early as December 15 and will continue through February. PhD applications have earlier deadlines
Academic background	An undergraduate degree in Engineering is required for admission to both MS and PhD programs. Strong quantitative skills are essential.
Work Experience	Work experience is not essential but is recommended
Tests	TOEFL score of 550 (Minimum) GRE scores in the 90% and above, especially in Math

Source: This information is based on internal materials produced by IIE and resources readily accessible on the internet.