Graduate School 101
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Options After Graduation with a B.S. in Engineering

- Industry, Government, and Military
- Independent entrepreneur
- Social or mission service
- Medical School
- Law school
- Graduate School in Engineering
Defer Attending Graduate School - Challenges

• Academic
• Financial
• Time Management
Attending Graduate School while Working - Challenges

• Time Constraints
• Fewer employers are paying for education
• Reduced flexibility for research oriented degrees
Advantages of Graduate Education

- Confidence in solving difficult problems
- Appreciation for research
- Greater knowledge depth in a specific area
- Global issues
- Independent learner
- New learning skills
- Opportunity to interact with students from overseas

- Leadership skills
- Communication skills
- Life long learning
- Higher wages
- Challenging job assignments
- Greater responsibility
- Greater job flexibility
- Learn to think out of the box
The Importance of Continual Learning

- Your career could be 40-50 years long
- No degree or training will be valid for this length of time – technology is advancing at increasing rates
- You will need to continue to learn or will be out-dated quickly
- Education is a continuing process for all of our lives
- Graduate school’s most important feature is that it helps you master how to continually learn
Options for Engineers with a Doctoral Degree

• Industrial R&D
• Government
• Defense
• National Laboratories
• Academia
What Should You Get From Graduate School?

- New learning skills
- New confidence in solving difficult problems
- New appreciation in research
- New knowledge in a specific area
- New perspectives on globalization
- New and broader outlooks on many technical and non-technical topics
- Leadership skills
Just some of the disciplines......

*Average Starting Salaries* 2007

<table>
<thead>
<tr>
<th>Major</th>
<th>BS</th>
<th>MS</th>
<th>Ph.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerospace</td>
<td>$50,993</td>
<td>$62,930</td>
<td>$72,529</td>
</tr>
<tr>
<td>Biomedical</td>
<td>$48,503</td>
<td>$59,667</td>
<td>Not available</td>
</tr>
<tr>
<td>Chemical</td>
<td>$53,813</td>
<td>$57,260</td>
<td>$79,591</td>
</tr>
<tr>
<td>Civil</td>
<td>$43,679</td>
<td>$48,050</td>
<td>$59,625</td>
</tr>
<tr>
<td>Computer</td>
<td>$52,464</td>
<td>$60,354</td>
<td>$69,625</td>
</tr>
<tr>
<td>Electrical</td>
<td>$51,888</td>
<td>$64,416</td>
<td>$80,206</td>
</tr>
<tr>
<td>Industrial</td>
<td>$49,567</td>
<td>$56,561</td>
<td>$85,000</td>
</tr>
<tr>
<td>Mechanical</td>
<td>$50,236</td>
<td>$59,880</td>
<td>$68,299</td>
</tr>
<tr>
<td>Nuclear</td>
<td>$51,182</td>
<td>$58,814</td>
<td>Not available</td>
</tr>
<tr>
<td>Petroleum</td>
<td>$61,516</td>
<td>$68,833</td>
<td>Not available</td>
</tr>
</tbody>
</table>

Source: Sloan Career Cornerstone Center/NACE
Attracting U.S. Students to Graduate School-Challenges

- Numbers gap
- Ambition gap
- Education gap

CONSEQUENCE

- In the Age of Flatism, these gaps are what most threaten our standard of living.

“The World is Flat”; Thomas L. Friedman; Douglas & McIntrye, Ltd., 2005
## Challenges - Numbers Gap

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>POPULATION (MILLIONS)</th>
<th># BACCALAURATE ENGINEERS/YR</th>
<th># BACCALAURATE ENGINEERS/YR/MILLION</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>293</td>
<td>70,949</td>
<td>242</td>
</tr>
<tr>
<td>CHINA</td>
<td>1299</td>
<td>&gt;200,000</td>
<td>&gt;154</td>
</tr>
<tr>
<td>INDIA</td>
<td>1065</td>
<td>&gt;200,000</td>
<td>&gt;188</td>
</tr>
<tr>
<td>FRANCE</td>
<td>60</td>
<td>28,000</td>
<td>467</td>
</tr>
<tr>
<td>UNITED KINGDOM</td>
<td>60</td>
<td>16,200</td>
<td>270</td>
</tr>
<tr>
<td>GERMANY</td>
<td>82</td>
<td>40,000</td>
<td>488</td>
</tr>
<tr>
<td>WORLDWIDE</td>
<td>&gt;6000</td>
<td>&gt;1,000,000</td>
<td>&gt;167</td>
</tr>
</tbody>
</table>

Source: ASEE\(^1\); Weekly Magazines, and CIA Fact Book; National Academy of Engineering; National Institute of Informatics
### Earned Degrees Confirmed in US, 2003-04

<table>
<thead>
<tr>
<th>Field</th>
<th>Baccalaureate</th>
<th>Masters</th>
<th>Doctoral</th>
<th>Total</th>
<th>Fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>63,558</td>
<td>32,698</td>
<td>5923</td>
<td>102,179</td>
<td>5%</td>
</tr>
<tr>
<td>Business, Management, and Marketing</td>
<td>306,623</td>
<td>139,344</td>
<td>1481</td>
<td>447,448</td>
<td>23%</td>
</tr>
<tr>
<td>All Fields</td>
<td>1,339,542</td>
<td>558,940</td>
<td>48378</td>
<td>1,946,860</td>
<td>100%</td>
</tr>
<tr>
<td>Dentistry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15,442</td>
</tr>
<tr>
<td>Law</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40,209</td>
</tr>
<tr>
<td>Veterinary Medicine</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2228</td>
</tr>
</tbody>
</table>

U.S. Leadership in Science and Technology

• Qualified U.S. students with baccalaureate degrees in engineering have an obligation to consider graduate school in engineering.
Need for Innovation (L-Directed Thinking)

- Abundance
- Asia
- Automation

From Agriculture to Conceptual Age

ATG
(affluence, technology, globalization)

Conceptual Age
(creators and empathizers)

Information Age
(knowledge workers)

Industrial Age
(factory workers)

Agriculture Age
(farmers)

18th century 19th century 20th century 21st century
HOW TO CHOOSE A GRADUATE PROGRAM
Graduate Program Quality Indicators

• Faculty
• Curriculum
• Quality of Incoming Graduate Students
• Quality of Graduates (value added)
• Resources/Infrastructure
Faculty

• Size (451 total, 385 Tenured/Tenure-Track)
• Research Funding
• Scholarship
• Visibility
Research Funding - Quality

• Peer Reviewed Competitive Grants e.g. NSF, NIH,
Total Engineering Research Expenditures

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Expenditures (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY01</td>
<td>91</td>
</tr>
<tr>
<td>FY02</td>
<td>102</td>
</tr>
<tr>
<td>FY03</td>
<td>109</td>
</tr>
<tr>
<td>FY04</td>
<td>115</td>
</tr>
<tr>
<td>FY05</td>
<td>109</td>
</tr>
</tbody>
</table>
Faculty Visibility

- Number of NAE members (12)
- Number of Endowed, Distinguished, and Regents Professorships (86, 5, 11)
- Number of members in State and National level policy making bodies
- Number of Editorships of Archival Journals
- Number of memberships on Editorial Boards of Archival Journals
- Number of Fellows in Professional Societies
Faculty Citations

• (ISI Web of Knowledge)
  http://portal.isiknowledge.com/portal.cgi
  ?DestApp=portal.cgi&Func=Frame&Init=
  Yes&SID=2AoC6hB5M2EFcK15aK
Scholarship

Quantitative
• No. of Refereed Journal Articles
• No. of Conference Papers
• No. of Patents
• No. of Textbooks and Research Monographs

Qualitative
• Journal Impact Factors
• Immediacy Index
• Cited Half Life
• No. of Citations
• h-index
• Acceptance Rate per Conference
Curriculum

- Number of Graduate Courses taught per year (398)
- Number of Special Topics Taught per year (69)
- Number of Graduate Courses omitted from the catalog per year (50)
- Number of cross listed graduate courses taught per year (76)
Quality of Incoming Students

- GPA
- GRE Scores (Average for Fall ’06: Verbal 496, Quantitative 751, Analytical 672, Writing 4)
- Academic Preparation
- Acceptance Rate (33.7% of 5647 applications)
- Composition of Domestic Students (26.1%)
- Composition of underrepresented minority students (6.8%)
COE Graduate Enrollment

Fall Semesters

Number of Graduate Students

- 1998: 1646
- 1999: 1799
- 2001: 1974
- 2002: 2093
- 2003: 2215
- 2004: 2153
- 2005: 2064
- 2006: 2206
- 2007: 2368
## College of Engineering Graduate Admission - Selectivity

<table>
<thead>
<tr>
<th>Acceptance Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
</tr>
<tr>
<td>2005</td>
</tr>
<tr>
<td>2006</td>
</tr>
<tr>
<td>2007</td>
</tr>
<tr>
<td>42.7%</td>
</tr>
<tr>
<td>45.9%</td>
</tr>
<tr>
<td>36.2%</td>
</tr>
<tr>
<td>33.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average GRE Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall’03</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>V</td>
</tr>
<tr>
<td>521</td>
</tr>
<tr>
<td>494</td>
</tr>
</tbody>
</table>
Quality of Graduates

- Currently over 490 TAMU – COE PhDs hold academic positions within U.S. and abroad
Resources and Infrastructure

- Percent of students on Financial Support
- Number of Endowed Fellowships
- Number of Federal Graduate Fellowships (NSF, GEM, D. Ed., DOE)
- Space per Graduate Student
- Graduate Student Salary
RANKINGS

- U.S. News and World Report
- London Times
## Best Graduate Engineering Schools

**Public Institutions**

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Berkeley</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>Illinois (Urbana) (-)</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>Georgia Tech (+)</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>Michigan (-)</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>Purdue (+)</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>University of Texas (-)</td>
</tr>
<tr>
<td>7</td>
<td>9</td>
<td>Wisconsin (-)</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>Texas A&amp;M</td>
</tr>
</tbody>
</table>

*Source: U.S. News and World Report rankings of U.S. universities*
Departmental National Rankings

**Ranked in 2007**
- 3rd (2nd) Petroleum Engineering
- 4th (3rd) Nuclear Engineering
- 9th (5th) Industrial Engineering
- 10th (5th) Aerospace Engineering
- 14th (8th) Civil Engineering
- 23rd (13th) Electrical Engineering
- 22nd (13th) Mechanical Engineering
- 26th (15th) Computer Engineering
- 30th (18th) Chemical Engineering
- 32nd (16th) Biomedical Engineering

*Note: first number is ranking by all institutions; numbers in ( ) are only public institutions*

*Source: U.S. News and World Report rankings of U.S. universities*
How to Apply

- [www.applytexas.org](http://www.applytexas.org) to complete on-line application
- Application fee
- Official Transcripts
- GRE Scores
- Letters of Recommendation (3)
- Statement of Purpose
- Resume or Curriculum Vitae
Texas A&M University

- Consistently ranks among top 10 nationally in number of science and engineering doctoral degrees conferred each year
- Ranks among leaders nationally in number of doctoral degrees awarded to minority students
- Our students are highly sought after by employers
- Rare triple designation as a Land-, Sea-, and Space-Grant institution reflects the broad scope of its research endeavors.
Engineering Graduate Disciplines

- Aerospace Engr.
- Biological & Agric. Engr.
- Biomedical Engr.
- Chemical Engr.
- Civil Engr.
- Computer Engr.
- Computer Science
- Electrical & Computer Engr.
- Health Physics
- Industrial & Systems Engr.
- Industrial Distr.
- Materials Sci. & Engr.
- Mechanical Engr.
- Nuclear Engr.
- Ocean Engr.
- Petroleum Engr.
Aerospace Engineering

• Research Areas
  – Space Technology
  – Aerodynamics and Fluid Dynamics
  – Materials and Structures

http://aero.tamu.edu/?view=academics/graduate/advisor.php
Biological and Agricultural

Research Areas:


http://baen.tamu.edu/academics/graduates/degree_programs.asp
Biomedical Engineering

Research Areas:

- Biomechanics, Biomedical Electronics and Instrumentation,
- Human Factors and System Safety, Biomedical Imaging,
- Nano and Micro Biosensing and Imaging,
- Nonlinear Optical Microscopy,
- Orthopedic Rehabilitation Engineering,
- Optical Diagnostics,
- Clinical Engineering

http://biomed.tamu.edu/academics/grad.htm
Artie McFerrin Department of Chemical Engineering

• Research Areas
  – Bio-(medical, chemical, molecular) & life sciences
  – Computational chemistry
  – Materials
  – Process systems

http://cheweb.tamu.edu/education/grad.php
Research Areas:


http://www.civil.tamu.edu/Academics/graduate/
Electrical and Computer Engineering

Research Areas:

- Analog & Mixed Signal, Biomedical Imaging and Genomic Signal Processing,
- Computer Engineering, Control Systems, Electromagnetic and Microwaves,
- Electric Power and Power Electronics, Solid State Electronics,
- Photonics and Nano-Engineering,
- Telecommunications and Signal Processing

http://www.ee.tamu.edu/htmlFrames.htm
Industrial and Systems Engineering

Research Areas:
- Production and service systems
- Logistics and supply chain management
- Transportation
- Quality and reliability engineering
- Homeland security
- Decision analysis
- Optimization
- Modeling and analysis of probabilistic systems
- Simulation modeling
- Virtual reality and 3D visualization

http://ie.tamu.edu/academic/graduate/for_more_info.html
Mechanical Engineering

• Research Areas
  – Materials
  – Mechanics
  – Systems and Controls
  – Thermal and Fluid Sciences

http://www.mengr.tamu.edu/Academics/GraduateProgram/graduateprogram.html
Nuclear Engineering

• Research Areas
  – Reactor Analysis / Computational Methods
  – Space Nuclear Power
  – Radiation Biology
  – Reactor Experiments
  – Dosimetry
  – Nuclear Power Plant Engineering
  – Irradiation Effects on Materials

http://nuclear.tamu.edu/home/prospective/graduate/index.php
Harold Vance Department of Petroleum Engineering

Research Areas:
• Tight Gas
• Shale Gas
• Heavy Oil Recovery
• Coalbed-Methane Reservoirs
• Natural Gas Hydrates
• Resource Assessment and Uncertainty Analysis
• Advanced Drilling Technology
• Well Construction
• Deep Gas Well Construction
• Advanced Production Technology
• Well Stimulation
• Reservoir Simulation
• Formation Evaluation
• Reservoir Visualization

• Enhanced Recovery
• Naturally Fractured Reservoirs
• Analysis of Reservoir Performance
• Energy
• Environmental and Water Issues
• Transportation Innovation

http://www.pe.tamu.edu/homepage/Academics/Grad.shtml
TAMU – College of Engineering Graduate Recruitment
Events/Opportunities

• Graduate Invitational
  – March 7-8, 2008
  – [http://essap.tamu.edu/gi](http://essap.tamu.edu/gi)
• Undergraduate Summer Research Grant Program (USRG)
  – May 27 – August 1, 2008
  – [http://essap.tamu.edu/usrg](http://essap.tamu.edu/usrg)
• NSF Graduate Research Fellowship Workshop
  – September 11, 2007
• GEM Fellowship Information Night
  – Fall Semester (TBA)
• Graduate School 101 Workshop
  – Fall and Spring Semesters (Feb. 12, 2008)
• Fast Track
  – TBA
Engineering Graduate Programs
204 Zachry

• Dr. N. K. Anand
  – Associate Dean, Graduate Programs
  – Phone: 862-8869
  – Email: nkanand@tamu.edu

• Ms. Teresa Wright
  – Senior Coordinator, Graduate Studies
  – Phone: 845-6883
  – Email: t-wright@tamu.edu

• Ms. Naomi Gomez
  – Administrative Coordinator (1/2 time for graduate programs)
  – Phone: 845-7247
  – Email: n-gomez@tamu.edu
Any Questions?