

# ENGINEERING CHANGE

## A STUDY OF 1993-94 ENGINEERING ALUMNI

PENNSSTATE



Center for the Study  
of Higher Education



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American Society for Engineering Education

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Most of the questions below ask you to reflect on your undergraduate engineering program, your experience in it, or your engineering abilities and skills at the time you graduated. Please respond to these questions as they applied to you at that time.

Using pen or pencil, please completely fill in the appropriate box or circle with your response.

**Part I. Personal Information**

1. When you entered the institution from which you received your undergraduate engineering degree, were you:

- A first-time student
- A transfer student from a two-year institution
- A transfer student from a four-year institution

2. How old were you when you entered that institution?

3. Are you:  Male  Female

4. Were you a U.S. citizen at the time you graduated?  Yes  No (If "no," please go to Question 6)

5. If "Yes," with which of the following racial/ethnic groups do you closely identify? (Select all that apply.)

- White/European American
- American Indian/Alaskan Native
- Black/African American
- Hawaiian or Pacific Islander
- Hispanic or Latino
- Other (please specify): \_\_\_\_\_
- Asian

6. When you graduated, what was the highest level of formal schooling attained by your parents or guardians?

	Mother	Father	Guardian
High School Diploma, GED, or less	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Some college (incl. Associate's degree)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bachelor's degree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Advanced degree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. When you graduated, approximately what was your parents'/guardians' annual family income?

- Below \$20,000
- \$20,001-\$30,000
- \$30,001-\$50,000
- \$50,001-\$70,000
- \$70,001-\$90,000
- \$90,001-\$110,000
- \$110,001-\$130,000
- \$130,001-\$150,000
- More than \$150,000
- I don't know

8. Did you take the SAT or ACT tests? (Please select all that apply.)

- No. I did not take either exam.
- Yes, I took the SAT exams, and my scores were approximately:  
 SAT-Verbal    SAT-Math
- Yes, I took the ACT exam, and my Composite Score was approximately:

9. When you entered that institution, how well prepared were you for basic science and math courses?

- Not at all
- Slightly
- Moderately
- Very well prepared

10. Approximately what was your overall academic average in:

	High School	College
3.50-4.00 (A- to A)	<input type="radio"/>	<input type="radio"/>
3.00-3.49 (B to A-)	<input type="radio"/>	<input type="radio"/>
2.50-2.99 (B- to B)	<input type="radio"/>	<input type="radio"/>
2.00-2.49 (C to B-)	<input type="radio"/>	<input type="radio"/>
1.50-1.99 (C- to C)	<input type="radio"/>	<input type="radio"/>
Below 1.49 (Below C-)	<input type="radio"/>	<input type="radio"/>

11. As an undergraduate, were you:

- a. Enrolled primarily as a (please select one):  Full-time student  Part-time student
- b. Employed primarily (please select one):  Not employed while taking classes  
 On-campus, part-time while taking classes  
 Off-campus, part-time while taking classes  
 Full-time while taking classes

12. As an undergraduate, approximately how many months did you spend:

	Number of Months				
	None	1 - 4	5 - 8	9 - 12	More than 12 Months
As an intern or a co-op student in industry or an engineering firm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In organized study abroad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Traveling internationally (not study abroad)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Involved in student design project(s)/competition(s) beyond class requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13. As an undergraduate, how active were you in a student chapter of a professional society or engineering organization?

- Not at all  Somewhat  Moderately  Highly

Part II. Your Undergraduate Engineering Experiences

14. Thinking about your in-class and out-of-class experiences, please rate your ability at the time you graduated to do the following:

	Ability at time of completing Undergraduate Engineering Program				
	No Ability	Some Ability	Adequate Ability	More than Adequate Ability	High Ability
<b>A. Technical Skills and Abilities:</b>					
Apply knowledge of math	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apply knowledge of physical sciences	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apply discipline-specific engineering knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design an experiment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Carry out an experiment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Analyze evidence or data from an experiment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interpret results of an experiment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understand essential aspects of the engineering design process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apply systematic design procedures to open-ended problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Design solutions to meet desired needs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Define key engineering problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Formulate a range of solutions to an engineering problem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Ability at time of completing Undergraduate Engineering Program				
	No Ability	Some Ability	Adequate Ability	More than Adequate Ability	High Ability
<b>B. Professional Skills:</b>					
Work in teams of people with a variety of skills and backgrounds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work with others to accomplish team goals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work in teams where knowledge and ideas from multiple engineering disciplines must be applied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conduct yourself professionally	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Work through ethical issues in engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consider ethical issues when working on engineering problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understand the engineering code of ethics	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understand technical codes and standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convey ideas in writing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convey ideas verbally	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convey ideas in formal presentations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Convey ideas with graphical representations (e.g. figures, graphs)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understand the impact of engineering solutions in a <b>global context</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understand the impact of engineering solutions in a <b>societal context</b>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understand contemporary issues (economic, environmental, political, societal, etc.) at the local, national, and world level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understand that engineering decisions and contemporary issues can impact each other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Use knowledge of contemporary issues to make engineering decisions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apply engineering <b>techniques</b> in engineering practice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apply engineering <b>skills</b> in engineering practice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apply engineering <b>tools</b> in engineering practice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Integrate engineering techniques, skills, and tools to solve real-world problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Manage a project	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apply interpersonal skills in managing people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Ability at time of completing  
Undergraduate Engineering Program**

	No Ability	Some Ability	Adequate Ability	More than Adequate Ability	High Ability
<b>C. Analytical/Thinking Skills:</b>					
Break down complex problems into simpler ones	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Apply fundamentals to problems that I hadn't seen before	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identify critical variables, information, and/or relationships involved in a problem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Know when to use a formula, algorithm, or other rule	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recognize and understand organizing principles (laws, methods, rules, etc.) underlying problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Draw conclusions from evidence or premises	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Develop a course of action based on my understanding of a whole system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ensure that a process or product meets a variety of technical and practical criteria	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Compare and judge alternative outcomes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Develop learning strategies that I could apply in my professional life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**15. When you graduated, to what extent were you:**

	Not at All	Somewhat	Moderately	Highly
Motivated to acquire and apply new technologies and tools	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Able to learn and apply new technologies and tools	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Willing to take advantage of new opportunities to learn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**16. How often did the following occur in the courses you took as an undergraduate in your department?**

	Almost Never	Occasionally	Often	Almost Always
Assignments and class activities were clearly explained.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assignments, presentations, and learning activities were clearly related to one another.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instructors made clear what was expected of students in the way of activities and effort.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I worked cooperatively with other students on course assignments.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Students taught and learned from each other.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There were opportunities to work in groups.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I discussed ideas with my classmates (individuals or groups).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I got feedback on my work or ideas from my classmates.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I interacted with other students in the course <b>outside of class</b> .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We did things that required students to be active participants in the teaching and learning process.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instructors gave me <b>frequent</b> feedback on my work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instructors gave me <b>detailed</b> feedback on my work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Instructors guided students' learning activities rather than lecturing or demonstrating the course material.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I interacted with instructors as part of the course.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I interacted with instructors <b>outside of class</b> (e.g. office hours, advising).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

17. How often did the following occur in your undergraduate engineering major?

	Almost Never	Occasionally	Often	Almost Always
My engineering courses emphasized tolerance and respect for differences.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My engineering courses encouraged me to examine my beliefs and values.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My engineering friends and I discussed diversity issues.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In my major, I observed the use of offensive words, behaviors, or gestures directed at students because of their identity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I was harassed or hassled by others in my major because of my identity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

18. Please indicate the extent to which you agree or disagree with the following statements as they applied to your undergraduate department:

	Strongly Disagree	Disagree	Neither nor Disagree	Agree	Strongly Agree
The faculty in my department were committed to treating all students fairly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My department emphasized the importance of diversity in the engineering workplace.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I knew some students who felt like they didn't fit in my department because of their identity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The campus climate at my institution was generally one of openness and tolerance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Part III. Additional Information**

19. How satisfied were you with your engineering program overall?

- Very dissatisfied    Dissatisfied    Neither satisfied nor dissatisfied    Satisfied    Very satisfied

20. When did you receive your undergraduate engineering degree?

1993:    Spring    Summer    Fall    Winter

1994:    Spring    Summer    Fall    Winter

Other (please specify):      Spring    Summer    Fall    Winter

21. What was the major field of your bachelor's degree?

- Aerospace Engineering    Electrical Engineering
- Chemical Engineering    Industrial Engineering
- Civil Engineering    Mechanical Engineering
- Computer Engineering    Other (please specify): \_\_\_\_\_

22. Did you have a second major or minor?

- No    Yes
- In engineering, science, or math
- Outside of engineering, science, or math (please specify): \_\_\_\_\_

23. Did you take the Fundamentals of Engineering (FE) Examination while an undergraduate?

- Yes    No   (If "no," please go to Question 24)
- a. If you took the FE, did you pass?    Yes    No
- b. How important was it to do well on the exam?
- Not important    Slightly important    Moderately important    Very important

24. Please indicate any degrees (and the field) you hold beyond the bachelor's degree.

Field/Degree	Master's	Advanced Certificate	Doctorate
Aerospace Engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chemical Engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Civil Engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Computer Engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Electrical Engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Industrial Engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mechanical Engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (please specify): _____	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

25. Please describe your professional plans when you graduated and your current circumstances.  
(Please select all that apply.)

	Plans when you received your undergraduate degree	Current Circumstances
<b>Employment:</b>		
In an engineering-related occupation <u>full-time</u>	<input type="radio"/>	<input type="radio"/>
In an engineering-related occupation <u>part-time</u>	<input type="radio"/>	<input type="radio"/>
Outside engineering <u>full-time</u>	<input type="radio"/>	<input type="radio"/>
Outside engineering <u>part-time</u>	<input type="radio"/>	<input type="radio"/>
<b>Graduate School:</b>		
In an engineering discipline <u>full-time</u>	<input type="radio"/>	<input type="radio"/>
In an engineering discipline <u>part-time</u>	<input type="radio"/>	<input type="radio"/>
Outside engineering <u>full-time</u>	<input type="radio"/>	<input type="radio"/>
Outside engineering <u>part-time</u>	<input type="radio"/>	<input type="radio"/>
<b>Unemployed:</b>		<input type="radio"/> If unemployed
<b>Other:</b>	<input type="radio"/>	<input type="radio"/> please go to Question 31

26. Are currently you in the professional engineer track of your organization?

Yes  No (If "no," please go to Question 27)

26a. If "Yes," at what level:

- Entry-level
- Mid-level
- Senior-level

27. Are you currently in the management track of your organization?

Yes  No (If "no," please go to Question 28)

27a. If "Yes," at what level:

- Line/entry-levelmanagement
- Program/mid-levelmanagement
- Executive/senior-levelmanagement

28. Which of the following best describes your functional area?

- Academic/corporate education
- Business/finance
- Human resources
- Information/technology/network support
- Management/administration/executive
- Marketing/sales
- Production, installation, delivery of services
- Research/development/testing
- Other (please specify): \_\_\_\_\_

**29. What is your organization's primary line of business at your location? [Categories used by the Engineering Workforce Commission of the American Association of Engineering Societies, Inc.]**

- Accommodation and food services
- Administrative and support and waste management and remediation services
- Agriculture, forestry, fishing and hunting
- Arts, entertainment, and recreation
- Construction
- Educational services
- Finance and insurance
- Health care and social assistance
- Information
- Management of companies and enterprises
- Manufacturing
- Mining (including oil and gas)
- Professional, scientific, and technical services
- Public administration (government/civil service/military)
- Real estate and rental leasing
- Retail trade
- Transportation and warehousing
- Utilities
- Wholesale trade
- Other (please specify): \_\_\_\_\_

**30. Approximately how many employees are there in your company at your location?**

- less than 50
- 50 - 499
- 500 - 3,000
- 3,001 - 10,000
- More than 10,000

**31. Have you been involved in hiring or evaluating recent bachelor's degree-level engineering graduates from any of the following fields: Aerospace, Chemical, Civil, Computer, Electrical, Industrial, or Mechanical Engineering?**

- Yes
- No

**32. If so, have you been involved in this process for 7 or more years (not necessarily for the same organization)?**

- Yes
- No

**33. If you answered "Yes" to Questions 31 and 32, are you willing to complete a 5 minute survey of employer views on the qualifications of recent engineering bachelor's degree recipients?**

- I would like to complete the survey on-line. Please go to <http://web.survey.psu.edu/employer7?>
- I would like to complete a paper version. Please send me a paper version of the survey. (Survey will be sent to same address as this one unless you e-mail us a preferred address.)
- No, I do not care to complete the "Employer" survey.

**Many thanks for your help!**

Please return this survey in the postage-paid envelope provided.