**Center for the Study of Higher Education**

**Preparing the Engineer of 2020 Program Chair Survey**
Welcome [School Name] Program Chairs

Thanks for checking us out! We need your help. The National Academy of Engineering has identified the knowledge and skills that engineers will need to succeed in the workplace of the future. This National Science Foundation-funded study is designed to benchmark the current state of undergraduate engineering education and find out if we're making progress toward those goals. To do that, we're surveying program chairs, faculty, students, and alumni at 35 colleges and universities around the country. (You can find out who else is participating at http://www.ed.psu.edu/educ/e2020/p2p-participating-institutions.)

We know you're busy, so we will really appreciate your help. We also think you may find completing this survey a good opportunity to reflect on your engineering program and your students' experiences.

The next page outlines your rights as a research participant and provides more details on the study. Once you review these, click on "I consent" to begin the survey, which should take about 20 minutes. And thanks for your time!

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PENNSTATE

**Center for the Study of Higher Education**

## Preparing the Engineer of 2020 Program Chair Survey

### Personal Information

1. What is your gender?
   - ❍ Man
   - ❍ Woman

2. Are you (check all that apply):

- ❑ African American
- ❑ Asian American
- ❑ Hispanic or Latino/a American
- ❑ Native American
- ❑ Caucasian/White
- ❑ Foreign National
- ❑ Naturalized U.S. Citizen
- ❑ Other (please specify) _____

3. What is your faculty rank?
   - ❍ Assistant professor
   - ❍ Associate professor
   - ❍ Full professor

4. Years in your current rank:
   _____ years

5. Years at this institution:
   _____ years

6. Years teaching at the college level (excluding graduate teaching assistantships)
   _____ years

7. In what field is your:

| | PhD | Your Primary Department |
|---|---|---|
| Bio-medical or Bio-engineering | ❍ | ❍ |
| Chemical Engineering | ❍ | ❍ |
| Civil Engineering | ❍ | ❍ |
| Electrical Engineering | ❍ | ❍ |
| General Engineering/Engineering Science | ❍ | ❍ |
| Industrial Engineering | ❍ | ❍ |
| Mechanical Engineering | ❍ | ❍ |
| Other (please specify) _____ | ❍ | ❍ |

8. How many years have you worked as an engineer outside of higher education (e.g., industry, government, self-employed)?

While employed full-time as a faculty member _____ years

Before working full-time as a faculty member _____ years

**Program Responsibilities**

9. Years as a program chair/department head in this or another institution: ____ years

10. How many years have you served at <u>any</u> institution as:

| | None | 1-3 years | 4-6 years | 7-9 years | 1 or more years |
|---|---|---|---|---|---|
| Curriculum or program coordinator | ❍ | ❍ | ❍ | ❍ | ❍ |
| Curriculum committee member or chair | ❍ | ❍ | ❍ | ❍ | ❍ |
| Undergraduate advising coordinator | ❍ | ❍ | ❍ | ❍ | ❍ |
| ABET self-study team member | ❍ | ❍ | ❍ | ❍ | ❍ |
| Dean or associate dean | ❍ | ❍ | ❍ | ❍ | ❍ |

11. In the <u>past five years</u> (at any institution), have you (check all that apply):

- ❑ Served as PI or Co-PI on a grant supporting undergraduate curriculum development or revision
- ❑ Led a major curriculum reform project in your department or college
- ❑ Facilitated development of a new course

**Undergraduate Program Curriculum and Instruction**

12. In a typical term, approximately what percent of your time is spent in (total must equal 100%):

| | |
|---|---|
| Administration | _____% |
| Teaching | _____% |
| Research | _____% |
| Fundraising | _____% |
| Service | _____% |

13. Tell us about the courses in your program that focus primarily on design.

| | Not offered | Optional course | Required course |
|---|---|---|---|
| First-year design | ❍ | ❍ | ❍ |
| Second-year design | ❍ | ❍ | ❍ |
| Third-year design | ❍ | ❍ | ❍ |
| Capstone design | ❍ | ❍ | ❍ |

14. Do the design teams in your course(s) have students from (check all that apply):

| First-year design | Second-year design | Third-year design | Capstone design |
|---|---|---|---|
| ❍Only within the program | ❍Only within the program | ❍Only within the program | ❍Only within the program |
| ❍Different engineering fields | ❍Different engineering fields | ❍Different engineering fields | ❍Different engineering fields |
| ❍Non-engineering fields | ❍Non-engineering fields | ❍Non-engineering fields | ❍Non-engineering fields |
| ❍Not sure | ❍Not sure | ❍Not sure | ❍Not sure |
| ❍Not offered | ❍Not offered | ❍Not offered | ❍Not offered |

**Topics in Engineering**

15. How much does your program curriculum emphasize:

| | Little/No emplasis | Slight | Moderate | Strong | Very strong | Not applicable |
|---|---|---|---|---|---|---|
| Ethical issues in engineering practice | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| The importance of life-long learning | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Current workforce and economic trends (globalization, outsourcing, etc.) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| The value of gender, racial/ethnic, or cultural diversity in engineering | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Creativity and innovation | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Emerging engineering technologies | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Examining beliefs and values and how they affect ethical decisions | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| How theories are used in engineering practice | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Making explicit connections to knowledge and skills from fields other than engineering | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |

**Professional Skills**

16. How much does your program curriculum emphasize:

| | Little/No emplasis | Slight | Moderate | Strong | Very strong | Not applicable |
|---|---|---|---|---|---|---|
| Professional skills (knowing codes and standards, being on time, meeting deadlines, etc.) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Written and oral communication skills | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Leadership skills | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Working effectively in teams | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Project management skills (budgeting, monitoring progress, managing people, etc.) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |

**Problem Solving**

17. How much does your program curriculum emphasize:

| | Little/No emplasis | Slight | Moderate | Strong | Very strong | Not applicable |
|---|---|---|---|---|---|---|
| Application of math and science to engineering problems | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Designing, conducting, and analyzing data from experiments | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Understanding how an engineering solution can shape and be shaped by environmental, social, cultural, political, legal, economic, and other considerations | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Understanding how non-engineering fields can help solve engineering problems | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Integrating knowledge from engineering and other fields to solve engineering problems | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Systems thinking (i.e., looking at entire systems rather than individual components) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Applying knowledge from other fields to solve an engineering problem | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Defining a design problem | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Generating and evaluating a variety of ideas about how to solve a problem | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Solving problems from real clients (industry, government, etc.) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Producing a product (prototype, program, simulation, etc.) | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |

18. Are most faculty members in your program part of your formal undergraduate advising system?

- ❍ No; professional staff advise undergraduates at all levels
- ❍ Yes, but only lower-division (first- and second-year students)
- ❍ Yes, but only upper-division (third- and fourth-year students)
- ❍ Yes, both lower- and upper-division students

**Program Information**

19. Does your program have an Industry Advisory Board or Council?

- ❍ Yes [Go to question 20]
- ❍ No [Go to question 21]

20. How involved is your Industry Advisory Board or Council in the following:

| | Not at all | Slightly | Moderately | Highly | Very highly |
|---|---|---|---|---|---|
| Curriculum review and/or reform | ❍ | ❍ | ❍ | ❍ | ❍ |
| Presentations to students | ❍ | ❍ | ❍ | ❍ | ❍ |
| Student internship placement | ❍ | ❍ | ❍ | ❍ | ❍ |
| Providing financial or other forms of support for the program | ❍ | ❍ | ❍ | ❍ | ❍ |
| Aid in ABET reviews | ❍ | ❍ | ❍ | ❍ | ❍ |

21. What kinds of preparation do graduate teaching assistants receive before their teaching assignment begins (check all that apply)?

- ❑ They do not receive any formal training
- ❑ They meet with the instructor for the course

They attend a department-level teaching orientation of:

- ❑ ½ - 2 hours
- ❑ 2 ½ - 4 hours
- ❑ 4 ½ - 6 hours
- ❑ 6 ½ - 8 hours
- ❑ More than one day

They attend some other teaching orientation of:

- ❑ Less than 2 hours
- ❑ 3-4 hours
- ❑ 5-6 hours
- ❑ One day
- ❑ More than one day

22. What kinds of supervision and/or evaluation do graduate teaching assistants undergo? Check all that apply.

- ❑ TAs are formally supervised
- ❑ Undergraduate students fill out evaluations at the end of term that include questions about TAs
- ❑ TAs are formally evaluated by course instructor
- ❑ TAs are formally evaluated by a third party (not the course instructor)

23. How much do the following limit your program's ability to improve its undergraduate curriculum?

| | Not at all | Slightly | Moderately | Very | Extremely |
|---|---|---|---|---|---|
| Outdated lab equipment | ❍ | ❍ | ❍ | ❍ | ❍ |
| Space or facilities constraints | ❍ | ❍ | ❍ | ❍ | ❍ |
| Faculty stretched too thin | ❍ | ❍ | ❍ | ❍ | ❍ |
| Faculty apathy | ❍ | ❍ | ❍ | ❍ | ❍ |
| Emphasis on research in reward system | ❍ | ❍ | ❍ | ❍ | ❍ |
| Lack of support staff (e.g., clerical, technical, laboratory) | ❍ | ❍ | ❍ | ❍ | ❍ |
| Lack of teaching assistantships | ❍ | ❍ | ❍ | ❍ | ❍ |
| High student-faculty ratios | ❍ | ❍ | ❍ | ❍ | ❍ |
| ABET requirements | ❍ | ❍ | ❍ | ❍ | ❍ |
| Institution-wide curriculum requirements | ❍ | ❍ | ❍ | ❍ | ❍ |

24. How much do you use data on student learning in:

| | Not at all | Slightly | Moderately | Very | Extremely |
|---|---|---|---|---|---|
| Course redesign | ❍ | ❍ | ❍ | ❍ | ❍ |
| Course development | ❍ | ❍ | ❍ | ❍ | ❍ |
| Curriculum review and development | ❍ | ❍ | ❍ | ❍ | ❍ |
| Continuous improvement processes | ❍ | ❍ | ❍ | ❍ | ❍ |
| Faculty performance reviews | ❍ | ❍ | ❍ | ❍ | ❍ |
| Resource distribution | ❍ | ❍ | ❍ | ❍ | ❍ |

25. In your opinion, what is the relative weight your department gives to teaching versus research in:

| | Teaching ⟷ Research | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Not applicable |
| Hiring decisions | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Merit salary decisions | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Promotion and tenure decisions | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |

26. In general, how much do the following "count" in annual merit salary decisions and promotion and tenure reviews in your department?

| | Merit Salary | | | | | P&T | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Not at all | Slightly | Moderately | A good deal | A great deal | Not at all | Slightly | Moderately | A good deal | A great deal |
| Engineering education research grants | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Engineering education research publications | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Engineering education conference presentations | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Engineering-specific research grants | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Engineering-specific research publications | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Engineering-specific conference presentations | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| End-of-course evaluation results | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Curriculum or course development | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Writing textbooks | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Writing article/chapter/book on teaching, curriculum, or assessment | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Helping recruit women and underrepresented students | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Helping recruit women and underrepresented faculty | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Advising out-of-class student design competition teams | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Advising a student organization | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Serving as ABET coordinator | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |
| Serving on an ABET self-study team | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ | ❍ |

27. Do you agree or disagree with the following statements about your program?

| | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|
| We periodically review our program mission and objectives. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Faculty in my program generally resist new curricular ideas or experimentation. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Faculty often collaborate on curriculum development and revision. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Our curriculum is a frequent agenda item at program meetings. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Curriculum revisions in our program are typically made in response to some problem rather than through a periodic planning process. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Curriculum planning in my program is systematic. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Curriculum decisions in my program are usually based on opinions rather than data. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Most faculty in this program are knowledgeable about our curriculum beyond their own courses. | ❍ | ❍ | ❍ | ❍ | ❍ |

28. Do your non-tenure track, multi-year, full-time instructional staff have a vote in program curriculum decisions?

- ❍ We don't have any non-tenure track, multi-year, full-time instructional staff
- ❍ Yes
- ❍ No

**Views of Engineering and Engineering Education**

29. Several recent reports discuss the changing knowledge and skills engineers will need in the future and how engineering education should change. To what extent do you agree or disagree with the following statements about undergraduate engineering education?

| | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|
| Programs must periodically revise curricula so students are aware of new technologies. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Emphasizing professional skills takes time away from teaching technical content. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Humanities and social science courses are important in preparing engineers. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Students' leadership skills are best developed in extra-curricular activities. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Interdisciplinary learning–inside and outside engineering–should be part of the engineering curriculum. | ❍ | ❍ | ❍ | ❍ | ❍ |
| The engineering workplace requires systems thinking. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Concepts of sustainability should be a major focus of the undergraduate curriculum. | ❍ | ❍ | ❍ | ❍ | ❍ |
| It's very difficult to increase student diversity without sacrificing some academic quality. | ❍ | ❍ | ❍ | ❍ | ❍ |
| It's very difficult to increase faculty diversity without sacrificing some academic quality. | ❍ | ❍ | ❍ | ❍ | ❍ |

30. Do you agree or disagree that the engineering curriculum should:

| | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|
| Teach students about intercultural communication. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Start hands-on design in the first year and continue it throughout the program. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Teach students to consider all relevant factors (e.g., social, cultural, environmental) in designing solutions | ❍ | ❍ | ❍ | ❍ | ❍ |
| Cultivate student creativity. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Prepare students to assume community leadership roles. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Teach students learning strategies. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Prepare students to work effectively across national and cultural boundaries. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Address ethical issues in multiple courses. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Develop students who can think like entrepreneurs. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Provide opportunities for students to prepare for occupations other than engineering (e.g., business, medicine, law). | ❍ | ❍ | ❍ | ❍ | ❍ |

31. Do you agree or disagree that engineering programs should:

| | Strongly disagree | Disagree | Neither agree nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|
| Reward excellence in teaching commensurately with excellence in research. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Reward faculty who do peer-reviewed engineering education research. | ❍ | ❍ | ❍ | ❍ | ❍ |
| Take responsibility for working with community colleges to facilitate student transfer. | ❍ | ❍ | ❍ | ❍ | ❍ |

32. How familiar are you with the following National Academy of Engineering reports?

| | Unaware of it | Heard of it | Read/heard summaries | Read parts | Read most or all |
|---|---|---|---|---|---|
| *The Engineer of 2020: Visions of Engineering in the New Century* | ❍ | ❍ | ❍ | ❍ | ❍ |
| *Educating the Engineer of 2020: Adapting Engineering Education to the New Century* | ❍ | ❍ | ❍ | ❍ | ❍ |
| *Rising above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* | ❍ | ❍ | ❍ | ❍ | ❍ |