Berkeley Engineering

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UC Berkeley Mechanical Engineering College of Engineering: ABET Experience

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College of Engineering

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Our Mission:

"Educating Leaders, Creating Knowledge, Serving Society"

Excellence

- Undergraduate programs ranked No. 2
- Graduate programs ranked No. 3

-- U.S. News

Access

- Comprehensive review of all freshmen applicants
- More Pell grants (low-income students) than all Ivy Leagues combined
- Unusually strong group of applicants to the graduate programs
- From all over the world (both UG and G).

Graduates

- Academic institutions/government laboratories
- Industrial leaders
- National and international scenes

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Mechanical Engineering Dept

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- Ranked 2nd nationwide: both UG and Grad after MIT.
- 44 faculty members
  - 5 NAE(National Academy of Engineering) members
  - 14 NSF Faculty Early Career Development Awardees
  - 15 Endowed and Distinguished Chair Professors
- 590 Undergraduate Students
- 350 Graduate Students
- International network
  - Academic institutions
  - Industrial organizations

Accreditation Board of Engineering and Technology

- ABET assessment of engineering programs
  - Voluntary; Institution makes a request
  - Re-evaluation every six years to retain accreditation
  - Engineering Accreditation Commission EAC
  - Berkeley's engineering programs were accredited in 2012

- GENERAL CRITERIA FOR BACCALAUREATE LEVEL PROGRAMS
  - Criterion 1. Students
  - General Criteria 2. Program Educational Objectives
  - General Criteria 3. Student Outcomes
  - General Criteria 4. Continuous Improvement
  - General Criteria 5. Curriculum
  - General Criteria 6. Faculty
  - General Criteria 7. Facilities
  - General Criterion 8. Institutional Support
- Shortcomings with respect to criteria
  - Deficiency (D), Weakness (W), or Concern (C)

ME Undergraduate Educational Objective

Berkeley Engineering (2007)

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The objectives of the ME undergraduate program are to produce graduates who:

- Vigorously engage in post-baccalaureate endeavors, whether in engineering graduate study, in engineering practice, or in the pursuit of other fields, such as science, law, medicine, business or public policy.
- Apply their mechanical engineering education to address the full range of technical and societal problems with creativity, imagination, confidence and responsibility.
- Actively seek out positions of leadership within their profession and their community.
- Serve as ambassadors for engineering by exhibiting the highest ethical and professional standards, and by communicating the importance and excitement of this dynamic field.
- Retain the intellectual curiosity that motivates lifelong learning and allows for a flexible response to the rapidly 66evolving challenges of the 21st century.

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Student Outcomes

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a. an ability to apply knowledge of mathematics, science, and engineering

b. an ability to design and conduct experiments, as well as to analyze and interpret data

c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

d. an ability to function on multi-disciplinary teams

e. an ability to identify, formulate, and solve engineering problems

f. an understanding of professional and ethical responsibility

g. an ability to communicate effectively

h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

i. a recognition of the need for, and an ability to engage in life-long learning

j. a knowledge of contemporary issues

k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Assessment and Continuing Improvement

- Program Objectives
  - Attainment of objectives may not be immediately assessed.
- Students Outcomes
  - Can be assessable immediately

Assessment: Educational Objectives

Table 4-1. Assessment processes for evaluating attainment of Program Educational Objectives

Assessment Tool	Target Audience	Frequency	Satisfactory Response
Survey	Employers	Annually	Mean of 3.5 or better for each Objective
Survey	Alumni	Annually	Mean of 3.5 or better (single question)
Focus Group Discussion	ME External Advisory Board	Annually	Positive verbal feedback

Assessment: Student Outcomes

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Assessment Tool	Target Audience	Frequency	Source	Satisfactory Response
End-of-Course ABET Outcomes Survey	Students	Every Course Every Semester	Department	Mean of 3.5 or better for each Objective
Student Work	Students	Every Course Every Semester	Department	Satisfactory coursework
Survey	Graduating Seniors	Annually	College	Mean of 3.5 or better for each Objective
Survey	Recruiters/ Employers	Annually	Department	Mean of 3.5 or better for each Objective
Survey	Alumni	Annually	College	Mean of 3.5 or better (single question)
Fundamentals of Engineering Exam	Seniors & Alumni	Offered twice per year	Nat'l Council of Examiners for Engineering and Surveying	Passing rate exceeds the national average
Principles and Practice of Engineer Exam	Alumni	Offered twice per year	Nat'l Council of Examiners for Engineering and Surveying	Passing rate exceeds the national average
Success in Graduate School	Alumni	Annually	NSF Survey of Earned Doctorates and WebCASPAR	Largest number of graduates completing the PhD degree in ME compared to other institutions

ABET Evaluation Course Summaries

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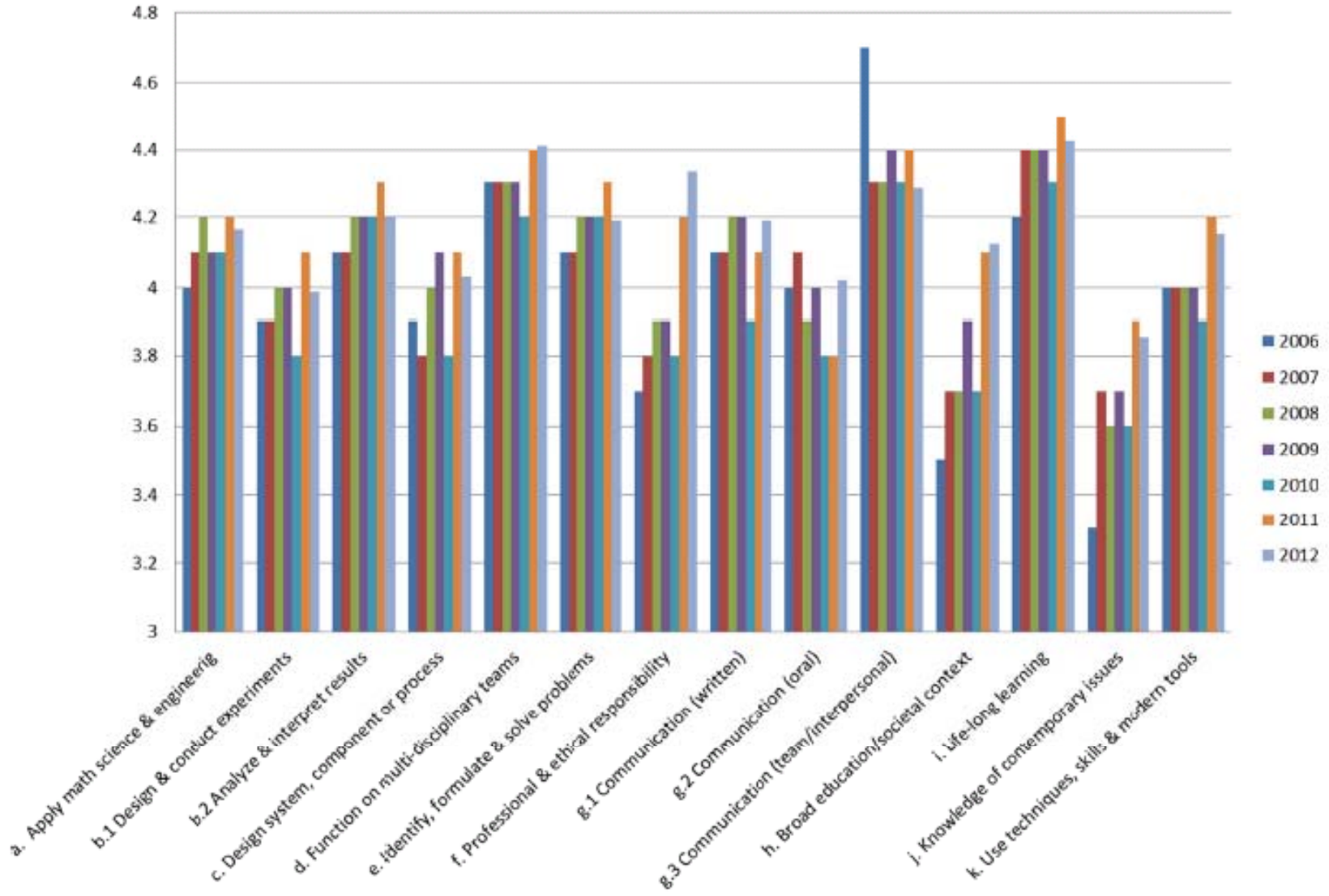
ME 107											
98 RESPONDENTS											
	FREQUENCIES										
	[2]	[3]	[4]	[5]	[6]	[7]	[N/A]	[Omit]	Average	Std. Dev.	Median
1. (a) an ability to apply knowledge of mathematics, science, and engineering	3	10	39	43				1	4.2	0.9	4
2. (b) an ability to design and conduct experiments, as well as to analyze and interpret data	4	4	38	51				1	4.4	0.8	5
3. (e) an ability to identify, formulate, and solve engineering problems	7	18	30	40				1	4	1	4
4. (f) an understanding of professional and ethical responsibility	12	27	18	27			5	1	3.5	1.3	3
5. (g) an ability to communicate effectively	1	11	43	39				2	4.2	0.8	4
6. (i) a recognition of the need for, and ability to engage in life-long learning	11	21	29	27			1	1	3.6	1.2	4
7. (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	3	15	32	44				1	4.1	1	4

Graduating Senior Survey: Student Outcomes



Comparison to National Norms

Table 4-7. Numbers of students and graduates from the Mechanical Engineering program at UC Berkeley taking and passing a Fundamentals of Engineering Exam or a Principles and Practice of Engineering Exam between April 2006 and October 2011.

	Fundamentals of Engineering (FE) Exam		Principles & Practice of Engineering (PE) Exam	
	UCB ME	National	UCB ME	National
No. Examinees Taking	272	56,178	151	14,793
No. Examinees Passing	263	43,119	101	8,762
Percent Examinees Passing	96.7%	76.8%	66.9%	59.2%

Continuous Improvement

- The ABET and Undergraduate Study Committee
- Utilize the student ABET evaluations for continuous improvement
- A focus group discussion with students
- Town hall meeting with graduating seniors
- Seek inputs to the external advisory committee

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ABET Program Audit Summary

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PROGRAM AUDIT SUMMARY

(PROVIDE A COPY TO INSTITUTION AT EXIT MEETING)

Use "C" for concern, "W" for weakness, and "D" for deficiency in the appropriate line.[1]	Shortcomings from Previous Review	Exit Meeting	Seven Day Response	Draft Statement			Final Statement		
				Team Chair	Editor 1	Editor 2	Team Chair	Editor 1	Editor 2
If the program has no deficiencies or weaknesses, check this line.									
1. STUDENTS		C							
2. PROGRAM EDUCATIONAL OBJECTIVES									
3. STUDENT OUTCOMES									
4. CONTINUOUS IMPROVEMENT		C							
5. CURRICULUM									
6. FACULTY									
7. FACILITIES									
8. INSTITUTIONAL SUPPORT									
PROGRAM CRITERIA									
ACCREDITATION POLICIES AND PROCEDURES									

Explanations of Concerns

1. STUDENTS Criterion 1 requires that each program must ensure and document that students who graduate meet all graduation requirements. The university is in the midst of implementing the DARS system as part of its "records keeping" system to monitor, document and certify that students meet graduation requirements. The DARS system, as implemented, does not accurately flag all potential degree audit issues, thereby necessitating manual audits for each student. Evidence was presented that showed some faculty advisors are unable to access DARS data to review how and why course decisions were made, and answers to questions on transfer courses were often inaccessible. Although review of all transcripts indicated that these graduates met all graduation requirements, future compliance with this criterion may be jeopardized.

4. CONTINOUS IMPROVEMENT

Criterion 4 states: 'Regular use of appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained'

The program has a process in place that uses a number of tools, including student work, course, senior, faculty self-evaluation, alumni, employer surveys, and FE and PE exam results. One or more of these tools is used to assess each outcome. There is a primary reliance on survey-based tools, with a secondary reliance on direct faculty evaluation of student work for outcomes assessment. There is a concern that information from a primarily survey-based self-evaluation structure may potentially not be sufficient to identify needs for improvement in outcomes. Since there is an inherent time lag in survey tools, and individual courses address multiple outcomes, the potential exists that poor performance on one outcome may go undetected for a period of time.