2015-2016
Annual Assessment Report Template

For instructions and guidelines visit our **website**
or **contact us** for more help.

Report: | BS Computer Engineering |

Question 1: Program Learning Outcomes

Q1.1.
Which of the following Program Learning Outcomes (PLOs) and Sac State Baccalaureate Learning Goals (BLGs) **did you assess?** [**Check all that apply**]

- ☑ 1. Critical Thinking
- ☐ 2. Information Literacy
- ☐ 3. Written Communication
- ☐ 4. Oral Communication
- ☑ 5. Quantitative Literacy
- ☐ 6. Inquiry and Analysis
- ☐ 7. Creative Thinking
- ☐ 8. Reading
- ☐ 9. Team Work
- ☑ 10. Problem Solving
- ☐ 11. Civic Knowledge and Engagement
- ☐ 12. Intercultural Knowledge and Competency
- ☐ 13. Ethical Reasoning
- ☐ 14. Foundations and Skills for Lifelong Learning
- ☐ 15. Global Learning
- ☐ 16. Integrative and Applied Learning
- ☐ 17. Overall Competencies for GE Knowledge
- ☐ 18. Overall Competencies in the Major/Discipline
- ☐ 19. Other, specify any assessed PLOs not included above:

a. | An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. |
b. | |
c. | |

Q1.2.
Please provide more detailed background information about **EACH PLO** you checked above and other information such as how your specific PLOs are **explicitly** linked to the Sac State BLGs:

Q1.2.1.
Do you have rubrics for your PLOs?

- ○ 1. Yes, for all PLOs
- ○ 2. Yes, but for some PLOs
- ○ 3. No rubrics for PLOs
- ○ 4. N/A

○ 5. Other, specify: [   ]

Q1.3.
Are your PLOs closely aligned with the mission of the university?

○ 1. Yes

○ 2. No

○ 3. Don't know

Q1.4.
Is your program externally accredited (other than through WASC Senior College and University Commission (WSCUC))?

○ 1. Yes

○ 2. No (skip to **Q1.5**)

○ 3. Don't know (skip to **Q1.5**)

Q1.4.1.
If the answer to Q1.4 is **yes**, are your PLOs closely aligned with the mission/goals/outcomes of the accreditation agency?

○ 1. Yes

○ 2. No

○ 3. Don't know

Q1.5.
Did your program use the *Degree Qualification Profile* (DQP) to develop your PLO(s)?

○ 1. Yes

○ 2. No, but I know what the DQP is

○ 3. No, I don't know what the DQP is

○ 4. Don't know

Q1.6.
Did you use action verbs to make each PLO measurable?

○ 1. Yes

○ 2. No

○ 3. Don't know

(**Remember**: Save your progress)

Question 2: Standard of Performance for the Selected PLO

Q2.1.
Select **ONE(1)** PLO here as an example to illustrate how you conducted assessment (be sure you *checked the correct box* for this PLO in Q1.1):

[Select PLO from list]

Q2.1.1.
Please provide more background information about the **specific PLO** you've chosen in Q2.1.

[   ]

Q2.2.
Has the program developed or adopted **explicit** standards of performance for this PLO?

○ 1. Yes

○ 2. No

○ 3. Don't know

○ 4. N/A

Q2.3.
Please **provide the rubric(s)** and **standards of performance** that you have developed for this PLO here or in the appendix.

[text box]

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Q2.4. PLO	Q2.5. Stdrd	Q2.6. Rubric	Please indicate where you have published the **PLO**, the **standard** of performance, and the **rubric** that was used to measure the PLO:
☐	☐	☐	1. In **SOME** course syllabi/assignments in the program that address the PLO
☐	☐	☐	2. In **ALL** course syllabi/assignments in the program that address the PLO
☐	☐	☐	3. In the student handbook/advising handbook
☐	☐	☐	4. In the university catalogue
☐	☐	☐	5. On the academic unit website or in newsletters
☐	☐	☐	6. In the assessment or program review reports, plans, resources, or activities
☐	☐	☐	7. In new course proposal forms in the department/college/university
☐	☐	☐	8. In the department/college/university's strategic plans and other planning documents
☐	☐	☐	9. In the department/college/university's budget plans and other resource allocation documents
☐	☐	☐	10. Other, specify: [text box]

Question 3: Data Collection Methods and Evaluation of Data Quality for the Selected PLO

Q3.1.
Was assessment data/evidence **collected** for the selected PLO?

○ 1. Yes
○ 2. No (skip to **Q6**)
○ 3. Don't know (skip to **Q6**)
○ 4. N/A (skip to **Q6**)

Q3.1.1.
How many assessment tools/methods/measures **in total** did you use to assess this PLO?
[Don't know]

Q3.2.
Was the data **scored/evaluated** for this PLO?

○ 1. Yes
○ 2. No (skip to **Q6**)
○ 3. Don't know (skip to **Q6**)
○ 4. N/A (skip to **Q6**)

Q3.2.1.
Please describe how you collected the assessment data for the selected PLO. For example, in what course(s) or by what means were data collected:

(**Remember**: Save your progress)

Question 3A: Direct Measures (key assignments, projects, portfolios, etc.)

Q3.3.
Were direct measures (key assignments, projects, portfolios, course work, student tests, etc.) used to assess this PLO?

- ○ 1. Yes
- ○ 2. No (skip to **Q3.7**)
- ○ 3. Don't know (skip to **Q3.7**)

Q3.3.1.
Which of the following direct measures were used? [**Check all that apply**]

- ☐ 1. Capstone project (e.g. theses, senior theses), courses, or experiences
- ☐ 2. Key assignments from required classes in the program
- ☐ 3. Key assignments from elective classes
- ☐ 4. Classroom based performance assessment such as simulations, comprehensive exams, or critiques
- ☐ 5. External performance assessments such as internships or other community-based projects
- ☐ 6. E-Portfolios
- ☐ 7. Other Portfolios
- ☐ 8. Other, specify:

Q3.3.2.
Please **explain** and **attach** the direct measure you used to collect data:

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Q3.4.
What tool was used to evaluate the data?

- ○ 1. **No** rubric is used to interpret the evidence (skip to **Q3.4.4.**)
- ○ 2. Used rubric developed/modified by the faculty who teaches the class (skip to **Q3.4.2.**)
- ○ 3. Used rubric developed/modified by a group of faculty (skip to **Q3.4.2.**)
- ○ 4. Used rubric pilot-tested and refined by a group of faculty (skip to **Q3.4.2.**)
- ○ 5. The VALUE rubric(s) (skip to **Q3.4.2.**)
- ○ 6. Modified VALUE rubric(s) (skip to **Q3.4.2.**)
- ○ 7. Used other means (Answer **Q3.4.1.**)

Q3.4.1.
If you used other means, which of the following measures was used? [**Check all that apply**]

☐ 1. National disciplinary exams or state/professional licensure exams (skip to **Q3.4.4.**)

☐ 2. General knowledge and skills measures (e.g. CLA, ETS PP, etc.) (skip to **Q3.4.4.**)

☐ 3. Other standardized knowledge and skill exams (e.g. ETC, GRE, etc.) (skip to **Q3.4.4.**)

☐ 4. Other, specify: _____ (skip to **Q3.4.4.**)

Q3.4.2.
Was the **rubric** aligned directly and explicitly **with the PLO**?

○ 1. Yes

○ 2. No

○ 3. Don't know

○ 4. N/A

Q3.4.3.
Was the **direct measure** (e.g. assignment, thesis, etc.) aligned directly and explicitly **with the rubric**?

○ 1. Yes

○ 2. No

○ 3. Don't know

○ 4. N/A

Q3.4.4.
Was the **direct measure** (e.g. assignment, thesis, etc.) aligned directly and explicitly **with the PLO**?

○ 1. Yes

○ 2. No

○ 3. Don't know

○ 4. N/A

Q3.5.
How many faculty members participated in planning the assessment data **collection** of the selected PLO?

Q3.5.1.
How many faculty members participated in the **evaluation** of the assessment data for the selected PLO?

Q3.5.2.
If the data was evaluated by multiple scorers, was there a norming process (a procedure to make sure everyone was scoring similarly)?

○ 1. Yes

○ 2. No

○ 3. Don't know

○ 4. N/A

Q3.6.
How did you **select** the sample of student work (papers, projects, portfolios, etc.)?

Q3.6.1.
How did you **decide** how many samples of student work to review?

Q3.6.2.
How many students were in the class or program?

Q3.6.3.
How many samples of student work did you evaluated?

Q3.6.4.
Was the sample size of student work for the direct measure adequate?

○ 1. Yes

○ 2. No

○ 3. Don't know

(**Remember**: Save your progress)

Question 3B: Indirect Measures (surveys, focus groups, interviews, etc.)

Q3.7.
Were indirect measures used to assess the PLO?

○ 1. Yes

○ 2. No (skip to **Q3.8**)

○ 3. Don't Know (skip to **Q3.8**)

Q3.7.1.
Which of the following indirect measures were used? [**Check all that apply**]

☐ 1. National student surveys (e.g. NSSE)

☐ 2. University conducted student surveys (e.g. OIR)

☐ 3. College/department/program student surveys or focus groups

☐ 4. Alumni surveys, focus groups, or interviews

☐ 5. Employer surveys, focus groups, or interviews

☐ 6. Advisory board surveys, focus groups, or interviews

☐ 7. Other, specify: [_____]

Q3.7.1.1.
Please explain and attach the indirect measure you used to collect data:

[   ]

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Q3.7.2.
If surveys were used, how was the sample size **decided**?

[   ]

Q3.7.3.
If surveys were used, how did you **select** your sample:

[   ]

Q3.7.4.
If surveys were used, what was the response rate?

[   ]

Question 3C: Other Measures (external benchmarking, licensing exams, standardized tests, etc.)

Q3.8.
Were external benchmarking data, such as licensing exams or standardized tests, used to assess the PLO?

○ 1. Yes

○ 2. No (skip to **Q3.8.2**)

○ 3. Don't Know (skip to **Q3.8.2**)

Q3.8.1.
Which of the following measures was used? [**Check all that apply**]

☐ 1. National disciplinary exams or state/professional licensure exams

☐ 2. General knowledge and skills measures (e.g. CLA, ETS PP, etc.)

☐ 3. Other standardized knowledge and skill exams (e.g. ETC, GRE, etc.)

☐ 4. Other, specify: [_____]

Q3.8.2.
Were other measures used to assess the PLO?

○ 1. Yes

○ 2. No (skip to **Q4.1**)

○ 3. Don't know (skip to **Q4.1**)

Q3.8.3.
If other measures were used, please specify:

[   ]

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(**Remember**: Save your progress)

Question 4: Data, Findings, and Conclusions

Q4.1.
Please provide simple tables and/or graphs to summarize the assessment data, findings, and conclusions for the selected PLO for **Q2.1**:

[   ]

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Q4.2.
Are students doing well and meeting the program standard? If not, how will the program work to improve student performance of the selected PLO?

[   ]

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Q4.3.
For the selected PLO, the student performance:

○ 1. **Exceeded** expectation/standard

○ 2. **Met** expectation/standard

○ 3. **Partially** met expectation/standard

○ 4. Did not meet expectation/standard

○ 5. No expectation/standard has been specified

○ 6. Don't know

Question 4A: Alignment and Quality

Q4.4.
Did the data, including the direct measures, from all the different assessment tools/measures/methods directly align with the PLO?

○ 1. Yes

○ 2. No

○ 3. Don't know

Q4.5.
Were **all** the assessment tools/measures/methods that were used good measures of the PLO?

○ 1. Yes

○ 2. No

○ 3. Don't know

Question 5: Use of Assessment Data (Closing the Loop)

Q5.1.
As a result of the assessment effort and based on prior feedback from OAPA, do you anticipate *making any changes* for your program (e.g. course structure, course content, or modification of PLOs)?

○ 1. Yes

○ 2. No (skip to **Q5.2**)

○ 3. Don't know (skip to **Q5.2**)

Q5.1.1.
Please describe *what changes* you plan to make in your program as a result of your assessment of this PLO. Include a description of how you plan to assess the impact of these changes.

Q5.1.2.
Do you have a plan to assess the *impact of the changes* that you anticipate making?

○ 1. Yes

○ 2. No

○ 3. Don't know

Q5.2.

How have the assessment data from the last annual assessment been used so far? [**Check all that apply**]	1. Very Much	2. Quite a Bit	3. Some	4. Not at All	5. N/A
1. Improving specific courses	○	○	○	○	○
2. Modifying curriculum	○	○	○	○	○
3. Improving advising and mentoring	○	○	○	○	○

4. Revising learning outcomes/goals	○	○	○	○	○
5. Revising rubrics and/or expectations	○	○	○	○	○
6. Developing/updating assessment plan	○	○	○	○	○
7. Annual assessment reports	○	○	○	○	○
8. Program review	○	○	○	○	○
9. Prospective student and family information	○	○	○	○	○
10. Alumni communication	○	○	○	○	○
11. WSCUC accreditation (regional accreditation)	○	○	○	○	○
12. Program accreditation	○	○	○	○	○
13. External accountability reporting requirement	○	○	○	○	○
14. Trustee/Governing Board deliberations	○	○	○	○	○
15. Strategic planning	○	○	○	○	○
16. Institutional benchmarking	○	○	○	○	○
17. Academic policy development or modifications	○	○	○	○	○
18. Institutional improvement	○	○	○	○	○
19. Resource allocation and budgeting	○	○	○	○	○
20. New faculty hiring	○	○	○	○	○
21. Professional development for faculty and staff	○	○	○	○	○
22. Recruitment of new students	○	○	○	○	○

23. Other, specify: [   ]

Q5.2.1.
Please provide a detailed example of how you used the assessment data above:

(**Remember**: Save your progress)

Additional Assessment Activities

Q6.
Many academic units have collected assessment data on aspect of their program *that are not related to the PLOs* (i.e. impacts of an advising center, etc.). **If** your program/academic unit has collected data on program *elements*, please briefly report your results here:

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Q7.
What PLO(s) do you plan to assess next year? [**Check all that apply**]

☐ 1. Critical Thinking

- ☐ 2. Information Literacy
- ☐ 3. Written Communication
- ☐ 4. Oral Communication
- ☐ 5. Quantitative Literacy
- ☐ 6. Inquiry and Analysis
- ☐ 7. Creative Thinking
- ☐ 8. Reading
- ☐ 9. Team Work
- ☐ 10. Problem Solving
- ☐ 11. Civic Knowledge and Engagement
- ☐ 12. Intercultural Knowledge and Competency
- ☐ 13. Ethical Reasoning
- ☐ 14. Foundations and Skills for Lifelong Learning
- ☐ 15. Global Learning
- ☐ 16. Integrative and Applied Learning
- ☐ 17. Overall Competencies for GE Knowledge
- ☐ 18. Overall Competencies in the Major/Discipline
- ☐ 19. Other, specify any PLOs not included above:

a. [   ]

b. [   ]

c. [   ]

Q8. Please attach any additional files here:

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Q8.1.
Have you attached any files to this form? If yes, please list every attached file here:

[   ]

Program Information (**Required**)

P1.
Program/Concentration Name(s): [by degree]

BS Computer Engineering

P1.1.
Program/Concentration Name(s): [by department]

Select...

P2.
Report Author(s):

[   ]

P2.1.
Department Chair/Program Director:

[   ]

P2.2.

Assessment Coordinator:

[   ]

P3.
Department/Division/Program of Academic Unit

[Select...   ]

P4.
College:

[Select...   ]

P5.
Total enrollment for Academic Unit during assessment semester (see Departmental Fact Book):

[   ]

P6.
Program Type:

- ○ 1. Undergraduate baccalaureate major
- ○ 2. Credential
- ○ 3. Master's Degree
- ○ 4. Doctorate (Ph.D./Ed.D./Ed.S./D.P.T./etc.)
- ○ 5. Other, specify: [   ]

P7. Number of **undergraduate degree programs** the academic unit has?

[Don't know]

P7.1. List all the names:

[   ]

P7.2. How many concentrations appear on the diploma for this undergraduate program?

[Don't know]

P8. Number of **master's degree programs** the academic unit has?

[Don't know]

P8.1. List all the names:

[   ]

P8.2. How many concentrations appear on the diploma for this master's program?

[Don't know]

P9. Number of **credential programs** the academic unit has?

[Don't know]

P9.1. List all the names:

P10. Number of **doctorate degree programs** the academic unit has?

Don't know

P10.1. List all the names:

When was your **assessment plan**...	1. Before 2010-11	2. 2011-12	3. 2012-13	4. 2013-14	5. 2014-15	6. No Plan	7. Don't know
P11. developed?	◯	◯	◯	◯	◯	◯	◯
P11.1. last updated?	◯	◯	◯	◯	◯	◯	◯

P11.3.
Please attach your latest **assessment plan**:

📎 **No file attached**

P12.
Has your program developed a **curriculum map?**

◯ 1. Yes

◯ 2. No

◯ 3. Don't know

P12.1.
Please attach your latest **curriculum map**:

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P13.
Has your program indicated in the curriculum map where assessment **of student learning** occurs?

◯ 1. Yes

◯ 2. No

◯ 3. Don't know

P14.
Does your program have a capstone class?

◯ 1. Yes, indicate:

◯ 2. No

◯ 3. Don't know

P14.1.
Does your program have **any** capstone project?

- ○ 1. Yes
- ○ 2. No
- ○ 3. Don't know

(**Remember**: Save your progress)

Computer Engineering (CpE) PLOs: Also referred to as Student Outcomes (SOs)

The CpE SOs are as follows, the same as those listed in EAC ABET:

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 multidisciplinary 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.

Table 0-1 Sacramento State Baccalaureate Learning Goals for the 21st Century

Competence in the Disciplines: The ability to demonstrate the competencies and values listed below in at least one major field of study and to demonstrate informed understandings of other fields, drawing on the knowledge and skills of disciplines outside the major.
Knowledge of Human Cultures and the Physical and Natural World through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts. Focused by engagement with big questions, contemporary and enduring.
Intellectual and Practical Skills, Including: inquiry and analysis, critical, philosophical, and creative thinking, written and oral communication, quantitative literacy, information literacy, teamwork and problem solving, practiced extensively, across the curriculum, in the context of progressively more challenging problems, projects, and standards for performance.
Personal and Social Responsibility, Including: civic knowledge and engagement— local and global, intercultural knowledge and competence*, ethical reasoning and action, foundations and skills for lifelong learning anchored through active involvement with diverse communities and real-world challenges.
Integrative Learning**, Including: synthesis and advanced accomplishment across general and specialized studies. **All of the above are demonstrated through the application of knowledge, skills, and responsibilities to new settings and complex problems.**

*Understanding of and respect for those who are different from oneself and the ability to work collaboratively with those who come from diverse cultural backgrounds.

Table 0-2 Mapping of CpE Program Educational Objectives (PEOs) and the University Baccalaureate Leaning Goals (BLGs).

CpE PEOs	University Baccalaureate Learning Goals				
	A Competence in the Disciplines	Knowledge of Human Cultures and the Physical and Natural World	Intellectual and Practical Skills	Personal and Social Responsibility	Integrative Learning
Core Knowledge	X	X			
Application of Knowledge	X		X		X
Life-long Learning	X	X			X
Professionalism				X	

Table 0-3 Mapping of CpE Program Educational Objectives (PEOs) and Student Outcomes (SOs)

Program educational objectives	Student Outcomes										
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
1. Core Knowledge:…	X	X			X						X
2. Application of Knowledge:…	X	X	X		X			X		X	X
3. Life-long Learning:…								X	X	X	X
4. Professionalism:…				X		X	X				

Table 0-4 Mapping of CpE SOs and the University Baccalaureate Leaning Goals (BLGs).

CpE SOs	University Baccalaureate Learning Goals				
	A Competence in the Disciplines	Knowledge of Human Cultures and the Physical and Natural World	Intellectual and Practical Skills	Personal and Social Responsibility	Integrative Learning
a)	X	X	X		X
b)	X	X	X		X
c)	X		X		X
d)				X	
e)	X	X	X		X
f)				X	
g)				X	
h)	X	X	X		X
i)	X	X			X
j)	X	X	X		X
k)	X	X	X		X

Computer Science SOs vs. Computer Engineering SOs

The CSc program uses a different set of student outcomes that are mapped to the CpE program SOs before the CSc assessment results are combined to generate the assessment results for the CpE program. Below is the list of SOs used to assess the Computer Science program, and **Error! Reference source not found.** is the mapping between the CSc SOs and the CpE SOs.

CSc SOs:

(a) Apply fundamental knowledge of mathematics, algorithmic principles, computer theory, and principles of computing systems in the modeling and design of computer-based systems that demonstrate an understanding of tradeoffs involved in design choices.

(b) Analyze a problem, specify the requirements, design, implement, and evaluate a computer-based system, process, component, or program that satisfies the requirements.

(c) Apply design and development principles in the construction of software systems of varying complexity.

(d) Use current skills, techniques, and tools necessary for computing practice.

(e) Function effectively as a member of a team to accomplish a common goal.

(f) Understand professional, ethical, and security issues and responsibilities.

(g) Write effectively.

(h) Give effective oral presentations.

(i) Recognize the need for, and have the ability to learn new technologies in computer science or related areas.

Table 0-5 Mapping of CSc SOs and CpE SOs.

CSc Student Outcome	a) ability to apply knowledge of mathematics, science, and	b) ability to design and conduct experiments, as well as to analyze	c) ability to design a system, component, or process to meet	d) ability to function on multidisciplinary teams	e) ability to identify, formulate, and solve engineering problems	f) understanding of professional and ethical responsibility	g) ability to communicate effectively	h) broad education necessary to understand the impact of	i) recognition of the need for, and an ability to engage in, life-long learning	j) knowledge of contemporary issues	k) ability to use techniques, skills, and modern engineering tools
a) Apply fundamental knowledge of mathematics, …	X										
b) Analyze a problem, specify the requirements, design, …		X									
c) Apply design and development principles, …			X								
d) Use current skills, techniques, and tools...											X
e) Function effectively as a member of a team …				X							
f) Understand professional, ethical, …						X					
g) Write effectively							X				

h) Give effective oral presentations …							X			
i) Recognize the need for, a have the …								X	X	

Table 0-6 Assessment Results: 2015-2016

a-1	Understand fundamental algorithms and essential data structures.	CSc 130	77%
a-2	Understand trade-offs in the selection of algorithms and data structures.	CSc 130	80%
a-3	Understand network architecture, layered model, and protocol stacks.	CpE 138	65%
a-4	Demonstrate the working knowledge of network management including monitoring, measurement, analysis, and control.	CpE 138	89%
a-5	Understand principles of concurrency and tradeoffs in synchronization approaches,	CSc 139	70%
a-6	Understand deadlocks and their solutions.	CSc 139	88%
a-7	Understand principles of resource management.	CSc 139	91%
		Average:	**80%**
b-1	Understand and apply error detection and correction, flow control, and congestion control principles.	CpE 138	78%
b-2	Understand and apply synchronization mechanisms to the critical section problem and to the process coordination.	CSc 139	91%
		Average:	**85%**

c	Demonstrate the ability to develop communication protocols and networking applications.	CpE 138	**87%**
k	Demonstrate competence in system programming in Unix/Linux environments.	CSc 139	**76%**

Assessment Plans

for

Computer Engineering Programs

Spring 2015

Introduction

The CpE B.S and M.S. degree programs at California State University, Sacramento are joint programs supported by both the Computer Science (CSc) and Electrical and Electronics Engineering (EEE) departments. The Computer Engineering (CpE) faculty members (including the CpE coordinator) are appointed in either the CSc or EEE department.

This report describes the processes used by the CpE faculty to monitor and assess the Program Educational Objectives (PEOs) and Student Outcomes (SOs) for the B.S. degree program – both of which have been established according to due process and the guidelines of ABET, the accrediting agency. This report also describes the processes used by the CpE faculty to assess the PEOs and SOs of the CpE M.S. degree program.

The SOs are defined as the knowledge and those skills that students should be able to demonstrate at the time of their graduation, and the PEOs are those professional characteristics that students should be able to demonstrate approximately five years after graduation. The processes to periodically review the PEOs and assess the SOs are also described.

B.S. Program Educational Objectives (PEOs)

The list of PEOs for the Computer Engineering B.S. degree is as follows:

1. *Core Knowledge*: Our graduates will have careers in computer engineering, or be engaged in a related career path.

2. *Application of Knowledge*: Our graduates will apply their knowledge and skills to solve practical engineering problems.

3. *Life-long Learning*: Our graduates will continue to develop their skills and seek knowledge after graduation in order to adapt to advancing technology and the needs of society. This may be indicated by the graduate's pursuit of an advanced degree or other formal instruction, and/or that the graduate has developed a professional specialty.

4. *Professionalism*: Our graduates will have the necessary professional skills, such as high ethical standards, effective oral and written communications, and teamwork, to be productive engineers and to advance in their careers.

B.S. Student Outcomes (SOs)

Excerpted from ABET General Criteria 3 for Accreditation of Engineering Programs, 2015-2016

"The program must have documented student outcomes that prepare graduates to attain the program educational objectives. Student outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program."

(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 multidisciplinary 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.

Constituencies of CpE Programs

The students, Alumni, employers, and faculty as a whole are the four major constituencies of the CpE programs.

Students and Alumni

The mission of the CpE Program at CSUS is to provide our students with high quality education with the necessary knowledge, skills, and abilities at the time of graduation to transform our graduates into professionals who are prepared to meet the needs of society and adapt to rapidly changing technology. CSUS has a diverse student body from a wide range of cultures and socioeconomic backgrounds and our current students as well as our graduates are the primary constituents of our program.

Employers

Computer related industries are the primary employers of graduates from the CpE Program. Our graduates enter a competitive market wherein such employers seek candidates with strong technical and communication skills as well as an ability to thrive within current industry standards and to address the challenges of the future. Our employers are in a unique position to reflect on the talents, abilities and skills that are necessary for our graduates to succeed in the workplace. Experienced employees from the local industries are invited to form the CpE Industry Advisory Council (IAC).
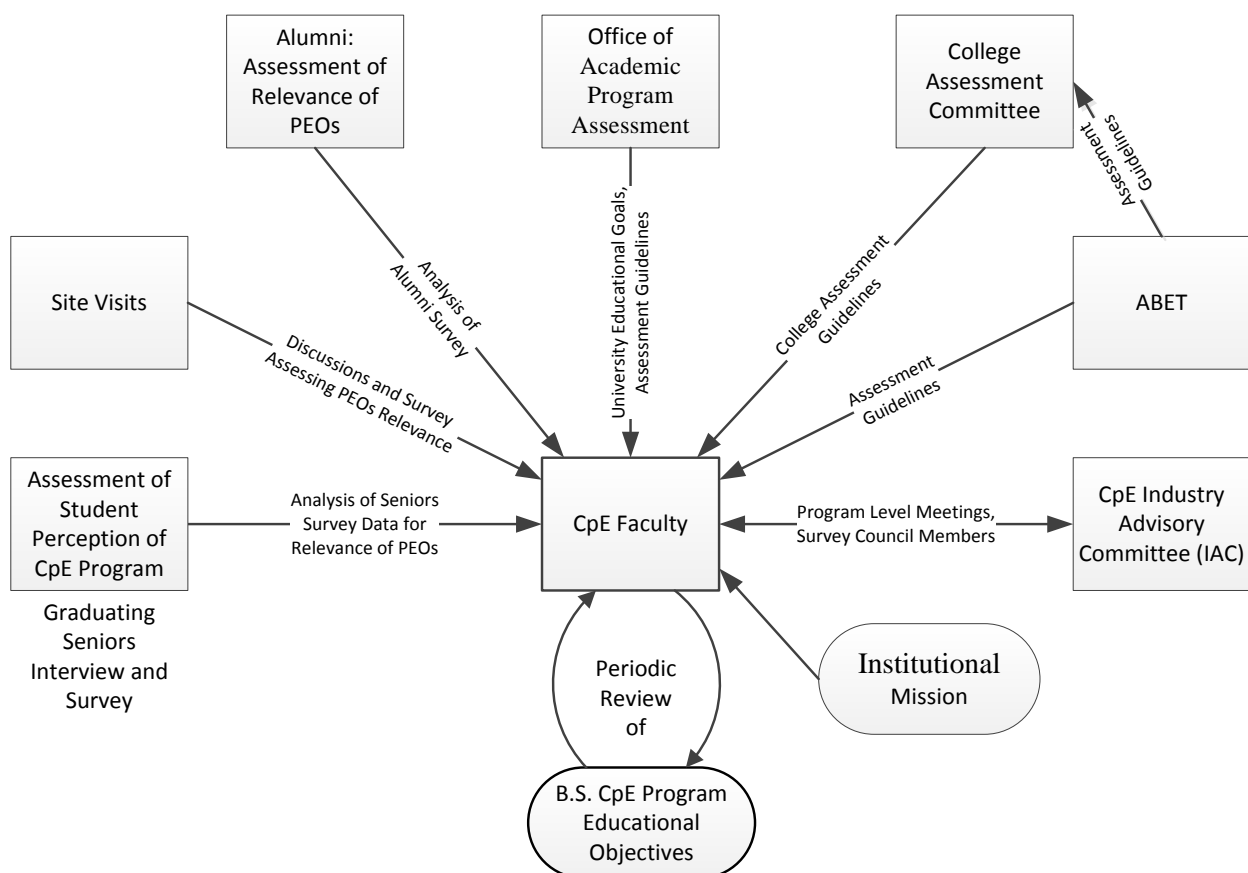
Faculty

Faculty at-large represent one of the important constituents of the program and they are directly responsible for the education of our students and ensuring that they are prepared to meet the educational objectives of our program. The Office of Academic Program Assessment defines undergraduate leaning goals and provides university-wide assessment guidelines and requirements and the College of Engineering and Computer Science

Assessment Committee provides additional guidelines for the Engineering programs in the College. The CpE faculty is involved directly by providing course outlines, creating course goals and objectives, assessing student outcomes, and closing the loop. Individual faculty members make minor changes within individual courses, while the entire CpE faculty acts upon major curriculum changes resulting from evaluation of the outcomes assessments.

B.S. PEOs Review Process

Figure 1 illustrates the process to periodically review and update the B.S. degree PEOs. The CpE faculty members receive inputs from various on campus committees, the program constituents, and ABET accrediting body to continuously review and assess the relevance of the PEOs. The Office of Academic Program Assessment defines the University Educational Goals and provides the campus wide assessment guidelines. The goals of the College Assessment Committee is for each Engineering program to exchange and share sound assessment practices and develop college-wide assessment standards and guidelines. The inputs from the CpE Industrial Advisory Council (IAC) meetings, site visits with local industries, student and Alumni, and ABET are used to periodically evaluate the relevance of the PEOs with respect to university and college mission, the needs of the industry, and requirements of the accreditation.

Figure 1 Flowchart of B.S. Program Educational Objectives Assessment

Table 1 outlines the methodologies used to periodically review the PEOs using the various inputs CpE faculty receive as shown in Figure 1.

Table 1 Process to Periodically Review B.S. Degree Program Educational Objectives

Constituent	Methodology	Inputs
Students	Graduating Senior Exit Interview and Survey (Sample list of graduating seniors interviewed every semester)	Verbal student recommendations; Seniors shall be asked to rate their perception of the CpE program in terms of the knowledge, skills, and abilities relating to the PEOs.
Alumni	Alumni survey, once every 3-5 years.	Survey collected by the Office of Institutional Research (OIS). The Alumni shall be asked to rate the relative importance of the PEOs as Essential, Important, Desirable, or Not Relevant.
Employers	The Industry Advisory Council (IAC) meetings, once every year; Site visits, one per year.	IAC meeting discussions and survey: The industry members of the Council shall rate the relevant importance of the PEOs as Essential, Important, Desirable, or Not Relevant. Members shall add additional objectives (if any) and also rate their relative importance. Company site visits and survey: The managers and Alumni/employees attending shall be asked to rate the relative importance of the PEOs, add and rate new objectives (if any), and provide recommendations to improve the program.
University/ College	Office of Academic Program Assessment; College Assessment Committee	University educational goals updates, University assessment guideline updates, College assessment guidelines updates
CpE Faculty	Faculty meetings to review PEOs based on the data and inputs received over the past three years	Analysis of Alumni, IAC, and site visits survey results, Evaluation of University, College, and/or ABET assessment guidelines updates

B.S. Degree SOs Assessment Process

The CpE B.S. degree curriculum includes math and science courses as well as CpE, CSc, EEE, and Engineering (ENGR) prefixed courses that are taught by faculty members from the CSc and EEE departments. The assessment of the CpE program relies on the assessment data received from the two departments where each department uses a different assessment methodology as outline below.

The EEE department uses a set of performance indicators, called Course Outcomes (COs), to assess (when applicable) all or a set of SOs in each course, and the CSc department uses a set of performance indicators from all the courses to assess the SOs for the entire program. The CSc department does not assess SOs in each course. In both cases the assessment instruments are direct and include exam questions, assignments, and/or projects.

For each course where COs are assessed the assessment data is first mapped to SOs using the template shown in Table 2 (Course SOs), where an "X" in any cell would indicate how an SO is assessed in each course. Two or more X's in a single column would indicate the SO is assessed using multiple COs. The data from all such maps is mapped to all the SOs, as illustrated in Table 3, to assess the CpE Program SOs, as required by ABET.

Table 2 Course SOs: Example Mapping Course Outcomes to Student Outcomes (for Courses Taught By EEE Department)

| Course Outcome (CO)	Student Outcome (SO)										
	a	b	c	d	e	f	g	h	i	j	k
1											
2											
3											
4											
. . .											

Place an X in each cell where the Course Outcome assesses the Student Outcome.

For courses that performance indicators are used to assess the SOs for the entire program, the assessment instruments (exam questions, assignments, and/or projects) directly measure the performance of each student on each of the indicators. Multiple indicators from multiple courses are used to assess all the SOs, as also illustrated in Table 3. The quantitative assessment results in Table 3 as well as the inputs from the College Assessment Committee and ABET are used for continuous improvement of the SOs as illustrated by the flowchart shown in Figure 2.

Table 3 CpE Program SOs: Example Mapping of CSc Performance Indicators (PIs) and EEE Course Outcomes (COs) to CpE Student Outcomes (SOs)

Student Outcome (SO)	Courses Taught by CSc Faculty				Courses Taught by EEE Faculty			
	Course 1 PIs	Course 2 PIs	Course 3 PIs	…	Course A COs	Course B COs	Course C COs	…
a								
b								
c								
d								
e								
f								
g								
h								
i								
k								

Place an X in each cell where a set of performance indicators CSc department or Course Outcomes from EEE department assesses a Student Outcome (SO).
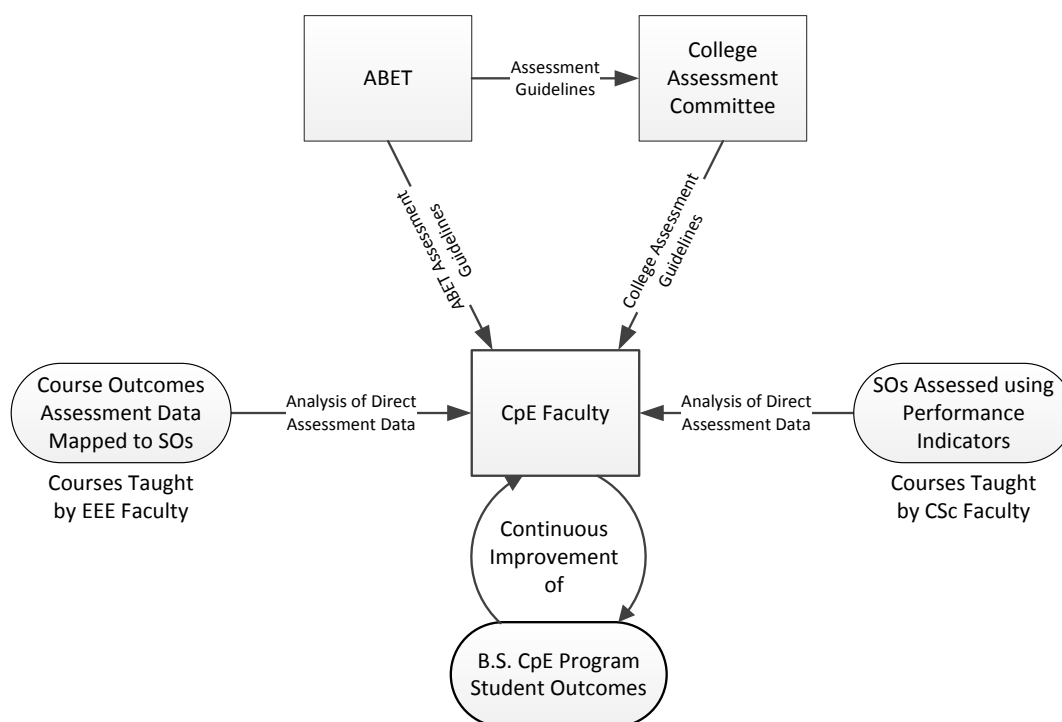
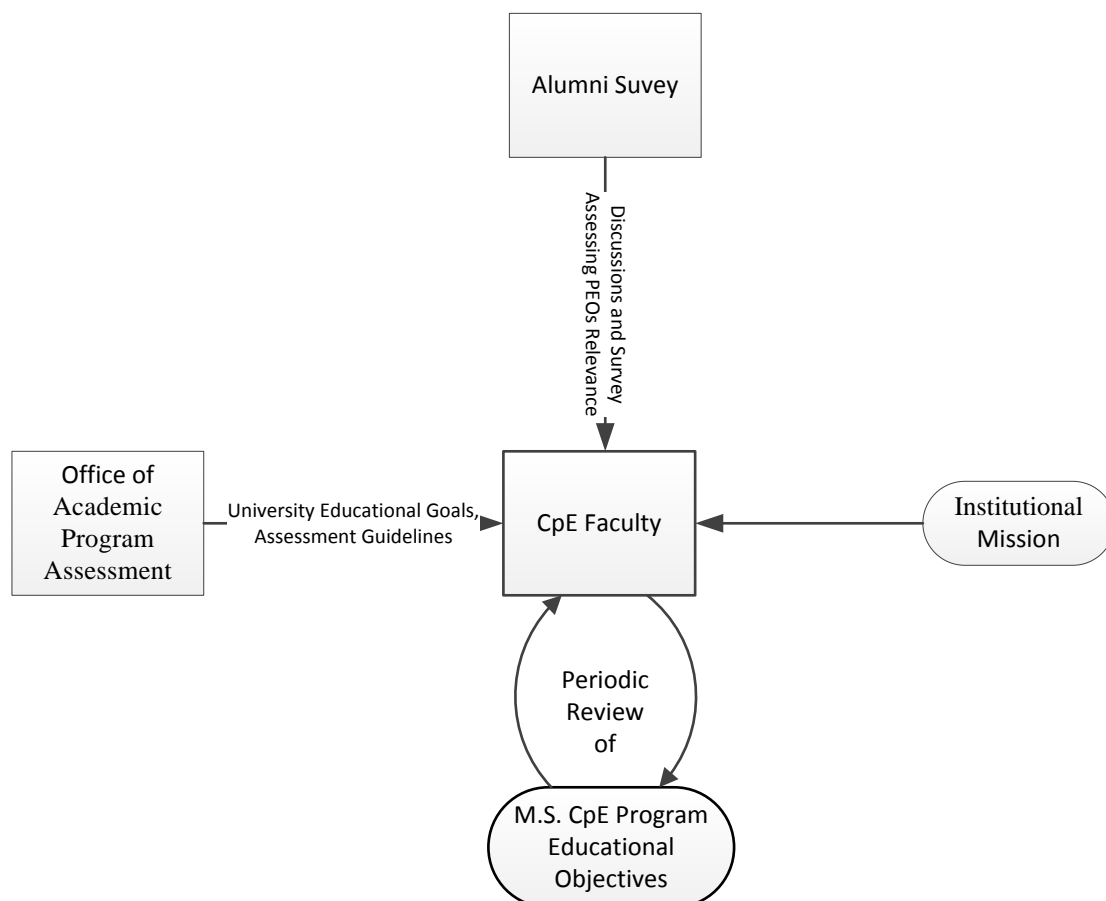**Figure 2 Flowchart of B.S. Student Outcomes Assessment**

Assessment of CpE Graduate Programs

The CpE M.S. degree requirements includes Plan A (Masters Project), Plan B (Thesis), or Plan C (Comprehensive Exam).

M.S. Program Educational Objectives

1. Graduates will be capable of integrating undergraduate fundamentals and advanced knowledge to solve complex Computer Engineering related problems

2. Graduates will be prepared for professional advancement in computer engineering. They will have the ability to pursue continuous learning and identify, understand, and apply new knowledge within the field.

3. Graduates will have the ability to undertake a research and development project and to document the work in clear and effective manner, appropriate to the standards in the field.

4. Graduates will have the ethics and the communication skills to be an effective team member.

The process used to periodically review the M.S. PEOs is shown in Figure 3.

Figure 3 Flowchart of M.S. Program Educational Objectives Assessment

M.S. Student Outcomes

a. Problem Solving: Graduates apply knowledge from their undergraduate and graduate computer engineering studies and related disciplines to solve complex computer engineering problems that require advanced knowledge within the field.

b. Critical thinking: Graduates understand and integrate new knowledge within the field.

c. Creative thinking: Graduates can plan and conduct projects on advanced topics within the field.

d. Written communication: Graduates can report on advanced topics within the field.

e. Integrative and applied learning: Graduates can work as a team in a diverse changing world.

f. Civic knowledge and engagement: Gradates recognize the ethical standards, and possess skills for effective communication.

Figure 4 illustrates the process used to assess the M.S. degree SOs.
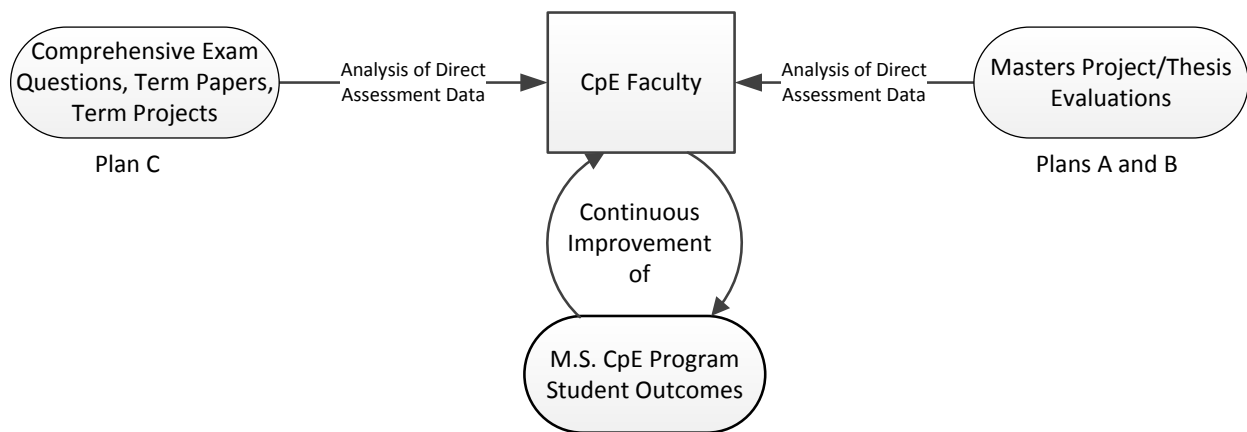
Figure 4 Flowchart of M.S. Student Outcomes Assessment

Table. Courses Contributing to CpE Student Learning Outcomes

ABET Learning Outcome	Engr 1*	Eng 17	Engr 120	CSc 15	CSc 20	CSc 28	CSc 60	CSc 35	CSc 130	CpE 138	CSc 139	EEE 117	EEE 117L	EEE 108	EEE 108L	EEE 180	CpE 64	CpE 142	CpE 151	CpE 159	CpE 166	CpE 185	CpE 186	CpE 190	CpE 191	Elective
a			X	X	X	X	X	X	X	X	X			X		X	X	X	X	X	X	X	X	X	X	
b			X	X	X	X	X	X		X	X				X		X	X		X	X	X	X		X	
c			X	X	X	X	X	X	X	X					X				X	X	X	X	X	X	X	
d	X																		X					X	X	
e			X											X		X	X	X		X	X			X	X	
f	X									X	X												X		X	
g	X					X									X	X		X			X		X	X	X	
h	X																							X	X	
i																			X				X		X	
j	X																		X				X	X	X	
k			X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	

* ENGR 96A is substituted for ENGR 1