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#### Undergraduate Program Assessment Report

#### Computer Science

**2016-2018**

Table of Contents Page

1. PROGRAM EDUCATIONAL OBJECTIVES 3
2. Program Educational Objectives 3
3. Review of Program Educational Objectives 3
4. STUDENT OUTCOMES 6
5. Students Outcomes 6
6. Satisfaction of Student Outcomes 6
7. Evaluation of Student Outcomes 8
8. Continuous Improvement 19
9. Constituent Members Comments 19

# PROGRAM EDUCATIONAL OBJECTIVES

1. **Program Educational Objectives**

Program Educational Objectives (PEOs) are broad statements that describe what graduates are expected to achieve within a few years of graduation. They provide guidelines, which offer a vision for the program.

The Program Educational Objectives of the undergraduate program in Computer Science at California State University, Los Angeles are as follows.

1. *Students who had entered the workforce will have established themselves as effective professionals by having solved real problems through the use of their computer science knowledge and their communication, critical thinking, and problem solving skills.*
2. *Students who had continued in academia will have been successful in pursuing advanced degrees and in demonstrating their ability to master advanced areas of computer science.*
3. *Students will have demonstrated their ability to adapt to a rapidly changing environment by having learned and applied new knowledge and skills.*
4. **Review of Program Educational Objectives**

Program Educational Objectives are discussed during the annual faculty retreat and the annual Industry Advisory Board meeting. A formal review process is conducted every three to five years. In each review cycle, Department Assessment Committee consider the following input and propose possible revisions:

* Existing Program Educational Objectives and Student Learning Outcomes
* Mission statements of the University, College and Department
* ACM curricular guidelines
* ABET accreditation standards
* Feedback from constituency surveys
* Feedback from IAB (Industrial Advisory Board) meetings

Proposed revisions are discussed at annual department faculty retreat, and the faculty vote on whether to adopt the revisions.

The department had conducted two major reviews of Program Educational Objectives. The first one took place in Spring 2012 when all the three PEOs were readopted. The second review of PEOs took place in 2015-2016 during the Q2S conversion process. The timeline is described in the table below:

|  |  |
| --- | --- |
| **Date** | **Activities** |
| Spring 2015/Spring 2016 | IAB meetings; Review PEOs(<https://csns.calstatela.edu/wiki/content/department/cs/assessment/iab/>) |
| 2016 to 2017 | During the IAB meetings and faculty retreats, the importance of the existing PEOs were discussed. Surveys were to seek further comments.  [Alumni](https://csns.calstatela.edu/department/cs/survey/view?id=5671939) (https://csns.calstatela.edu/department/cs/survey/view?id=5671939)[Faculty](https://csns.calstatela.edu/department/cs/survey/view?id=5670356) (https://csns.calstatela.edu/department/cs/survey/view?id=5670356)[IAB](https://csns.calstatela.edu/department/cs/survey/view?id=5624228) (https://csns.calstatela.edu/department/cs/survey/view?id=5624228) |
| Spring 2017 | Assessment Committee proposed minor revisions to Program Educational Objectives. Annual Faculty retreat. The changes to PEOs were adopted by faculty.(<https://csns.calstatela.edu/wiki/content/department/cs/assessment/retreat_presentations/>,  |
| Fall 2017 | IAB meeting; Review PEOs(<https://csns.calstatela.edu/wiki/content/department/cs/assessment/iab/>) |
| Spring 2018 | Annual Faculty retreat; Review PEOs(<https://csns.calstatela.edu/wiki/content/department/cs/assessment/retreat_presentations/>) |

Using this review process during 2015-2016, all three Program Educational Objectives were deemed important. After the Q2S conversion, program constituency surveys were formally conducted in 2016-2017 to review the importance of these Program Educational Objectives and to seek suggested changes. Minor revisions were suggested to clarify the meanings of PEO #1, PEO #2 and PEO #3 (See Constituent Member Comments) as described below:

1. *Change PEO #1 from "Students who enter...." to "Students who had entered....."*
2. *Change PEO #2 from "Students who continue..." to "Students who had continued....“*
3. *Change "new skills and new technologies" to "new knowledge and skills".*

These changes were formally adopted during the faculty retreat in Spring 2017. Prior to these changes, our Program Educational Objectives were as follows:

1. *Students who enter the workforce will have established themselves as effective professionals by having solved real problems through the use of their computer science knowledge and their communication, critical thinking, and problem solving skills.*
2. *Students who continue in academia will have been successful in pursuing advanced degrees and in demonstrating their ability to master advanced areas of computer science.*
3. *Students will have demonstrated their ability to adapt to a rapidly changing environment by having learned and applied new skills and new technologies.*

Figure 1. describes the survey results which were conducted to validate the importance of the PEOs.



**Figure 1: Importance of Program Educational Objectives**

Assuming all constituencies are weighted equally, all the Program Educational Objectives received an average rating higher than 4.5 out of a possible 5.0. Thus, the Program Educational Objectives are acceptable to the program constituencies.

# STUDENT OUTCOMES

**A.  Student Outcomes**

Student Learning Outcomes (SLOs) are specific skills that students will possess at the end of the degree program. Student Learning Outcomes provide curricular guidelines with respect to the program. The Student Learning Outcomes of the undergraduate program in Computer Science at California State University, Los Angeles are:

1. *Students will be able to apply concepts and techniques from computing and mathematics to both theoretical and practical problems.*
2. *Students will be able to demonstrate fluency in at least one programming language and acquaintance with at least three more.*
3. *Students will have a strong foundation in the design, analysis, and application of many types of algorithms.*
4. *Students will have a fundamental understanding of computer systems.*
5. *Students will have the training to analyze problems and identify and define the computing requirements appropriate to their solutions.*
6. *Students will have the training to design, implement, and evaluate large software systems working both individually and collaboratively.*
7. *Students will be able to communicate effectively, both orally and in writing.*
8. *Students will have the knowledge, skills, and attitudes for lifelong self-development.*
9. *Students will have the ability to analyze the local and global impact of computing on individuals and society.*
10. *Students will have a fundamental understanding of social, professional, ethical, legal, and security issues in computing.*

**B.  Satisfaction of Student Outcomes**

Program constituency surveys were conducted to review the SLOs and to seek suggested changes. Figure 2 describes the survey results which were conducted to validate the importance of the SLOs. All ten Student Learning Outcomes are deemed important by the review process during the 2016-2017 survey. Assuming all constituencies are weighted equally, all the Student Learning Outcomes received a ranking higher than 4.0/5.0:

* Student Learning Outcomes #1 received an average rating of 4.53/5;
* Student Learning Outcomes #2 received an average rating of 4.67/5;
* Student Learning Outcomes #3 received an average rating of 4.62/5;
* Student Learning Outcomes #4 received an average rating of 4.55/5;
* Student Learning Outcomes #5 received an average rating of 4.67/5;
* Student Learning Outcomes #6 received an average rating of 4.62/5;
* Student Learning Outcomes #7 received an average rating of 4.44/5;
* Student Learning Outcomes #8 received an average rating of 4.42/5;
* Student Learning Outcomes #9 received an average rating of 4.12/5;
* Student Learning Outcomes #10 received an average rating of 4.33/5;



 **Figure 2: Importance of Student Learning Outcomes**

The Student Learning Outcomes are acceptable to the program constituencies. In addition, comments from constituency members have been very positive, reinforcing the above results and indicates that the Student Learning Outcomes are aligned with industry needs.

The current Student Learning Outcomes were in place for the Fall 2012 ABET visit and remains unchanged through the 2018 ABET cycle. During the 2016-2017, the faculty considered a proposal to switch the SLOs to ABET criteria defined by “a” thru “k”. We had defined a clear mapping between SLOs (1..10) and ABET criteria (“a” thru “k”) . Adopting the ABET criteria as outcomes would also avoid the confusion of the two terminologies. However, we decided not to adopt it at this time as the ABET Computing Accreditation Commission already considering revising the “a” thru “k” criteria.

**C: Evaluation of Student Outcomes**

**SLO #1: Students will be able to apply concepts and techniques from computing and mathematics to both theoretical and practical problems.**

**1. Assessment Measures**

(a) CS 4963 Assessment Indicator #1 (Computational Theory)

The instructor of the capstone course CS 4963 conducts a number of assignments and exams. The performance of each student is normalized on a 5-point scale and recorded as the value of the *Computational Theory* performance indicator of the [Knowledge Outcomes Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=4733886).

This data is collected once a year in CS 4963.

(b) MFT Assessment Indicator #2 (Discrete Structures and Algorithms)

The ETS [Major Field Tests (MFT)](https://www.ets.org/mft/about) for Computer Science is a comprehensive undergraduate outcomes assessment tool designed to measure the critical knowledge and understanding obtained by students in a Computer Science degree program. In addition to student scores, MFT reports the average percent of the questions in subfields of the discipline answered correctly by the students, which are known as *Assessment Indicators*.

Students in CS 4963 are required to take the MFT exam. This data is collected once a year in CS 4963.

(c) Constituency Surveys (SLO #1)

Every year we survey four of our constituencies (students, faculty, alumni, and industry partners) on their satisfaction with our learning outcomes. The feedback indicates how well we achieve each learning outcome.

The surveys are conducted every year, and the data is analyzed and reported every two years.

2016-2018 CSULA Computer Science Undergraduate Program Surveys ([Student](https://csns.calstatela.edu/department/cs/survey/view?id=5898768)) ([Faculty](https://csns.calstatela.edu/department/cs/survey/view?id=5670329)) ([Alumni](https://csns.calstatela.edu/department/cs/survey/view?id=5898835)) ([IAB](https://csns.calstatela.edu/department/cs/survey/view?id=5951557))

**2. Assessment Data**

(a) Knowledge Outcomes Rubric

[CS4963 (2017-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=4733886&courseId=4933069)

 (b) MFT

[Individual Scores (2016-2018)](https://csns.calstatela.edu/department/cs/mft/score)

[Assessment Indicators (2006-2018)](https://csns.calstatela.edu/department/cs/mft/ai)

(c) Constituency Survey Result Summary

[2016-2018](https://csns.calstatela.edu/department/cs/survey/chart/view?id=5628880)

**SLO#2: Students will be able to demonstrate fluency in at least one programming language and acquaintance with at least three more.**

**1. Assessment Measures**

(a) CS 4963 Assessment Indicator #2 (Programming)

The instructor of the capstone course CS 4963 conducts a number of assignments and exams. The performance of each student is normalized on a 5-point scale and recorded as the value of the *Programming* performance indicator of the [Knowledge Outcomes Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=4733886).

This data is collected once a year in CS 4963.

(b) MFT Assessment Indicator #1 (Programming and Software Engineering)

The ETS [Major Field Tests (MFT)](https://www.ets.org/mft/about) for Computer Science is a comprehensive undergraduate outcomes assessment tool designed to measure the critical knowledge and understanding obtained by students in a Computer Science degree program. In addition to student scores, MFT reports the average percent of the questions in subfields of the discipline answered correctly by the students, which are known as *Assessment Indicators*.

Students in CS 4963 are required to take the MFT exam. This data is collected once a year in CS 4963.

(c) Constituency Surveys (SLO #2)

Every year we survey four of our constituencies (students, faculty, alumni, and industry partners) on their satisfaction with our learning outcomes. The feedback indicates how well we achieve each learning outcome.

The surveys are conducted every year, and the data is analyzed and reported every two years.

2016-2018 CSULA Computer Science Undergraduate Program Surveys ([Student](https://csns.calstatela.edu/department/cs/survey/view?id=5898768)) ([Faculty](https://csns.calstatela.edu/department/cs/survey/view?id=5670329)) ([Alumni](https://csns.calstatela.edu/department/cs/survey/view?id=5898835)) ([IAB](https://csns.calstatela.edu/department/cs/survey/view?id=5951557))

**2. Assessment Data**

(a) Knowledge Outcomes Rubric

[CS4963 (2017-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=4733886&courseId=4933069)

 (b) MFT

[Individual Scores (2016-2018)](https://csns.calstatela.edu/department/cs/mft/score)

[Assessment Indicators (2016-2018)](https://csns.calstatela.edu/department/cs/mft/ai)

(c) Constituency Survey Result Summary

[2016-2018](https://csns.calstatela.edu/department/cs/survey/chart/view?id=5628886)

**SLO #3: Students will have a strong foundation in the design, analysis, and application of many types of algorithms.**

**1. Assessment Measures**

(a) CS 4963 Assessment Indicator #3 (Algorithms)

The instructor of the capstone course CS 4963 conducts a number of assignments and exams. The performance of each student is normalized on a 5-point scale and recorded as the value of the *Programming* performance indicator of the [Knowledge Outcomes Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=4733886).

This data is collected once a year in CS 4963.

(b) MFT Assessment Indicator #2 (Discrete Structures and Algorithms)

The ETS [Major Field Tests (MFT)](https://www.ets.org/mft/about) for Computer Science is a comprehensive undergraduate outcomes assessment tool designed to measure the critical knowledge and understanding obtained by students in a Computer Science degree program. In addition to student scores, MFT reports the average percent of the questions in subfields of the discipline answered correctly by the students, which are known as *Assessment Indicators*.

Students in CS 4963 are required to take the MFT exam. This data is collected once a year in CS 4963.

(c) Constituency Surveys (SLO #3)

Every year we survey four of our constituencies (students, faculty, alumni, and industry partners) on their satisfaction with our learning outcomes. The feedback indicates how well we achieve each learning outcome.

The surveys are conducted every year, and the data is analyzed and reported every two years.

2016-2018 CSULA Computer Science Undergraduate Program Surveys ([Student](https://csns.calstatela.edu/department/cs/survey/view?id=5898768)) ([Faculty](https://csns.calstatela.edu/department/cs/survey/view?id=5670329)) ([Alumni](https://csns.calstatela.edu/department/cs/survey/view?id=5898835)) ([IAB](https://csns.calstatela.edu/department/cs/survey/view?id=5951557))

**2. Assessment Data**

(a) Knowledge Outcomes Rubric

[CS4963 (2017-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=4733886&courseId=4933069)

 (b) MFT

[Individual Scores (2016-2018)](https://csns.calstatela.edu/department/cs/mft/score)

[Assessment Indicators (2016-2018)](https://csns.calstatela.edu/department/cs/mft/ai)

(c) Constituency Survey Result Summary

[2016-2018](https://csns.calstatela.edu/department/cs/survey/chart/view?id=5628892)

**SLO #4: Students will have a fundamental understanding of computer systems.**

**1. Assessment Measures**

(a) CS 4963 Assessment Indicator #4 (Systems)

The instructor of the capstone course CS 4963 conducts a number of assignments and exams. The performance of each student is normalized on a 5-point scale and recorded as the value of the *Programming* performance indicator of the [Knowledge Outcomes Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=4733886).

This data is collected once a year in CS 4963.

(b) MFT Assessment Indicator #3 (Systems: Architecture/OS/Networking/Database)

The ETS [Major Field Tests (MFT)](https://www.ets.org/mft/about) for Computer Science is a comprehensive undergraduate outcomes assessment tool designed to measure the critical knowledge and understanding obtained by students in a Computer Science degree program. In addition to student scores, MFT reports the average percent of the questions in subfields of the discipline answered correctly by the students, which are known as *Assessment Indicators*.

Students in CS 4963 are required to take the MFT exam. This data is collected once a year in CS 4963.

(c) Constituency Surveys (SLO #4)

Every year we survey four of our constituencies (students, faculty, alumni, and industry partners) on their satisfaction with our learning outcomes. The feedback indicates how well we achieve each learning outcome.

The surveys are conducted every year, and the data is analyzed and reported every two years.

2016-2018 CSULA Computer Science Undergraduate Program Surveys ([Student](https://csns.calstatela.edu/department/cs/survey/view?id=5898768)) ([Faculty](https://csns.calstatela.edu/department/cs/survey/view?id=5670329)) ([Alumni](https://csns.calstatela.edu/department/cs/survey/view?id=5898835)) ([IAB](https://csns.calstatela.edu/department/cs/survey/view?id=5951557))

**2. Assessment Data**

(a) Knowledge Outcomes Rubric

[CS4963 (2017-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=4733886&courseId=4933069)

 (b) MFT

[Individual Scores (2016-2018)](https://csns.calstatela.edu/department/cs/mft/score)

[Assessment Indicators (2016-2018)](https://csns.calstatela.edu/department/cs/mft/ai)

(c) Constituency Survey Result Summary

[2016-2018](https://csns.calstatela.edu/department/cs/survey/chart/view?id=5628958)

**SLO #5: Students will have the training to analyze problems and identify and define the computing requirements appropriate to their solutions.**

**1. Assessment Measures**

(a) Rubric: Software Engineering - Requirements

The instructor of the software engineering course CS 3337 and the senior design course CS 4961 evaluate the Software Requirements Specifications (SRS) developed by the students for their projects. The evaluation uses the [Software Engineering - Requirements Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=6048588).

This data is collected in CS 3337 and CS 4961 whenever they are offered (i.e. at least once a year).

(b) Constituency Surveys (SLO #5)

Every year we survey four of our constituencies (students, faculty, alumni, and industry partners) on their satisfaction with our learning outcomes. The feedback indicates how well we achieve each learning outcome.

The surveys are conducted every year, and the data is analyzed and reported every two years.

2016-2018 CSULA Computer Science Undergraduate Program Surveys ([Student](https://csns.calstatela.edu/department/cs/survey/view?id=5898768)) ([Faculty](https://csns.calstatela.edu/department/cs/survey/view?id=5670329)) ([Alumni](https://csns.calstatela.edu/department/cs/survey/view?id=5898835)) ([IAB](https://csns.calstatela.edu/department/cs/survey/view?id=5951557))

**2. Assessment Data**

(a) Software Engineering - Requirements Rubric (Version 2.0)

[CS3337 (2017-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=6048588&courseId=4933007)

[CS4961 (2017)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=6048588&courseId=4933064)

(b) Constituency Survey Result Summary

[2016-2018](https://csns.calstatela.edu/department/cs/survey/chart/view?id=5628962)

**SLO #6: Students will have the training to design, implement, and evaluate large software systems working both individually and collaboratively.**

**1. Assessment Measures**

(a) Rubric: Software Engineering - Design

The instructor of the software engineering course CS 3337 and the senior design course CS 4962 evaluate the Software Design Documents (SDD) developed by the students for their projects. The evaluation uses the [Software Engineering - Design Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=6048592).

This data is collected in CS 3337 and CS 4962 whenever they are offered (i.e. at least once a year).

(b) Rubric: Software Engineering - Implementation

The instructor of the software engineering course CS 3337 and the senior design course CS 4962 evaluate the implementation of the student projects. The evaluation uses the [Software Engineering - Implementation Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=4689114).

This data is collected in CS 3337 and CS 4962 whenever they are offered (i.e. at least once a year).

(c) Rubric: Teamwork

Because the projects in CS 3337 and CS 4961/4962 are team projects, [Teamwork Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=4689030) is evaluated in these classes. Both instructor evaluation and peer evaluation are conducted where a team member is evaluated by both the project faculty advisor (or the instructor of the class) and the other team members.

This data is collected in CS 3337, CS 4961, and CS 4962 whenever they are offered (i.e. at least once a year).

(d) Constituency Surveys (SLO #6)

Every year we survey four of our constituencies (students, faculty, alumni, and industry partners) on their satisfaction with our learning outcomes. The feedback indicates how well we achieve each learning outcome.

The surveys are conducted every year, and the data is analyzed and reported every two years.

2016-2018 CSULA Computer Science Undergraduate Program Surveys ([Student](https://csns.calstatela.edu/department/cs/survey/view?id=5898768)) ([Faculty](https://csns.calstatela.edu/department/cs/survey/view?id=5670329)) ([Alumni](https://csns.calstatela.edu/department/cs/survey/view?id=5898835)) ([IAB](https://csns.calstatela.edu/department/cs/survey/view?id=5951557))

**2. Assessment Data**

(a) Software Engineering - Design Rubric (Version 2.0)

[CS3337 (2017-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=6048592&courseId=4933007)

[CS4962 (2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=6048592&courseId=4933067)

 (b) Software Engineering - Implementation Rubric

[CS3337 (2017-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=4689114&courseId=4933007&beginYear=2017&endYear=2018&evalType=INSTRUCTOR)

[CS4962 (2017-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=4689114&courseId=4933067)

 (c) Teamwork Rubric

[CS3337 (2016-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=4689030&courseId=4933007&beginYear=2016&endYear=2018&evalType=PEER)

[CS4961 (2016-2017)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=4689030&courseId=4933064)

[CS4962 (2017-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=4689030&courseId=4933067)

 (d) Constituency Survey Result Summary

[2016-2018](https://csns.calstatela.edu/department/cs/survey/chart/view?id=5628966)

**SLO #7: Students will be able to communicate effectively orally and in writing.**

**1. Assessment Measures**

(a) Rubric: Oral Communications

Students present their projects in the software engineering course CS 3337 and the senior design course sequence CS 4961/4962. The instructors of these courses evaluate these presentations using the [Oral Communications Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=5076959).

This data is collected in CS 3337, CS 4961, and CS 4962 whenever they are offered (i.e. at least once a year).

(b) Rubric: Written Communication

Students in CS 4961 and CS 4962 are given writing assignments such as an easy on personal observations about working in a real-world team project, and an essay on lifelong learning. The instructors evaluate these writing assignments using the [Written Communication Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=6040720).

This data is collected CS 4961 and CS 4962.

(c) Constituency Surveys (SLO #7)

Every year we survey four of our constituencies (students, faculty, alumni, and industry partners) on their satisfaction with our learning outcomes. The feedback indicates how well we achieve each learning outcome.

The surveys are conducted every year, and the data is analyzed and reported every two years.

2016-2018 CSULA Computer Science Undergraduate Program Surveys ([Student](https://csns.calstatela.edu/department/cs/survey/view?id=5898768)) ([Faculty](https://csns.calstatela.edu/department/cs/survey/view?id=5670329)) ([Alumni](https://csns.calstatela.edu/department/cs/survey/view?id=5898835)) ([IAB](https://csns.calstatela.edu/department/cs/survey/view?id=5951557))

**2. Assessment Data**

(a) Oral Communications Rubric (Version 2.0)

[CS3337 (2016-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=5076959&courseId=4933007)

[CS4961 (2016-2017)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=5076959&courseId=4933064)

[CS4962 (2017-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=5076959&courseId=4933067)

 (b) Written Communication Rubric (Version 2.0)

[CS4961 (2017)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=6040720&courseId=4933064)

[CS4962 (2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=6040720&courseId=4933067)

 (c) Constituency Survey Result Summary

[2016-2018](https://csns.calstatela.edu/department/cs/survey/chart/view?id=5628971)

**SLO #8: Students will have the knowledge, skills, and attitudes for lifelong self-development.**

**1. Assessment Measures**

(a) Rubric: Lifelong Learning

Students are required to write an essay on lifelong learning in the senior design course CS 4962 based on their experience of learning new tools and technologies during project development The instructor of the course evaluate these essays using the [Lifelong Learning Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=5660779).

This data is collected once a year in CS 4962.

(b) Constituency Surveys (SLO #8)

Every year we survey four of our constituencies (students, faculty, alumni, and industry partners) on their satisfaction with our learning outcomes. The feedback indicates how well we achieve each learning outcome.

The surveys are conducted every year, and the data is analyzed and reported every two years.

2016-2018 CSULA Computer Science Undergraduate Program Surveys ([Student](https://csns.calstatela.edu/department/cs/survey/view?id=5898768)) ([Faculty](https://csns.calstatela.edu/department/cs/survey/view?id=5670329)) ([Alumni](https://csns.calstatela.edu/department/cs/survey/view?id=5898835)) ([IAB](https://csns.calstatela.edu/department/cs/survey/view?id=5951557))

**2. Assessment Data**

(a) Lifelong Learning Rubric

[CS4962 (2017-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=5660779&courseId=4933067)

 (b) Constituency Survey Result Summary

[2016-2018](https://csns.calstatela.edu/department/cs/survey/chart/view?id=5628975)

**SLO #9: Students will have the ability to analyze the local and global impact of computing on individuals and society.**

**1. Assessment Measures**

(a) Rubric: Ethics in the Computer Age

CS 3801 is a required course that covers various societal and ethical issues in computing. Students in the class complete a number of assignments/exams/presentations. The performance of each student is normalized on a 5-point scale and recorded as the value of the *Global Impact of Computers* performance indicator of the [Ethics in the Computer Age Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=5802214).

This data is collected once a year in CS 3801.

(b) Constituency Surveys (SLO #9)

Every year we survey four of our constituencies (students, faculty, alumni, and industry partners) on their satisfaction with our learning outcomes. The feedback indicates how well we achieve each learning outcome.

The surveys are conducted every year, and the data is analyzed and reported every two years.

2016-2018 CSULA Computer Science Undergraduate Program Surveys ([Student](https://csns.calstatela.edu/department/cs/survey/view?id=5898768)) ([Faculty](https://csns.calstatela.edu/department/cs/survey/view?id=5670329)) ([Alumni](https://csns.calstatela.edu/department/cs/survey/view?id=5898835)) ([IAB](https://csns.calstatela.edu/department/cs/survey/view?id=5951557))

**2. Assessment Data**

(a) Ethics in the Computer Age Rubric (Version 2.0)

[CS3801 (2017-2018)](https://csns.calstatela.edu/department/cs/rubric/results.html?rubricId=5802214&courseId=4933018)

Additional data is available for [an older version of the rubric](https://csns.calstatela.edu/department/cs/rubric/results?id=4689086).

 (b) Constituency Survey Result Summary

[2016-2018](https://csns.calstatela.edu/department/cs/survey/chart/view?id=5628979)

**SLO #10: Students will have a fundamental understanding of social, professional, ethical, legal, and security issues in computing.**

**1. Assessment Measures**

(a) Rubric: Ethics in the Computer Age

CS 3801 is a required course that covers various societal and ethical issues in computing. Students in the class complete a number of assignments/exams/presentations. The performance of each student is normalized on a 5-point scale and recorded as the value of the *Ethical Theory and Reasoning* performance indicator of the [Ethics in the Computer Age Rubric](https://csns.calstatela.edu/department/cs/rubric/view?id=5802214).

This data is collected once a year in CS 3801.

(b) Constituency Surveys (SLO #10)

Every year we survey four of our constituencies (students, faculty, alumni, and industry partners) on their satisfaction with our learning outcomes. The feedback indicates how well we achieve each learning outcome.

The surveys are conducted every year, and the data is analyzed and reported every two years.

2016-2018 CSULA Computer Science Undergraduate Program Surveys ([Student](https://csns.calstatela.edu/department/cs/survey/view?id=5898768)) ([Faculty](https://csns.calstatela.edu/department/cs/survey/view?id=5670329)) ([Alumni](https://csns.calstatela.edu/department/cs/survey/view?id=5898835)) ([IAB](https://csns.calstatela.edu/department/cs/survey/view?id=5951557))

**2. Assessment Data**

(a) Ethics in the Computer Age Rubric (Version 2.0)

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(b) Constituency Survey Result Summary

[2016-2018](https://csns.calstatela.edu/department/cs/survey/chart/view?id=5628983)

**D: Continuous Improvement**

* All assessment results described in the above exceed the target levels. We are satisfied that students are achieving all the student outcomes.
* The 2016-2018 assessment cycle follows a very successful quarter to semester conversion in Fall 2016
* We continued to analyze the assessment data collected from various measures followed by faculty retreat discussions, and Industry Advisory Board reviews.
* *Develop courses in Machine Learning and Data Science:* Machine Learning and Data Science have become increasingly important sub-disciplines of computer science. Employers in our Industry Advisory Board have expressed a strong interest in having students who are knowledgeable in these areas. We strengthened our offerings in this area. In addition to the existing CS4660 (Artificial Intelligence), CS4661 (Introduction to Data Science), we have developed two new courses [CS 4662 (Advanced Machine Learning) and CS 4663 (Deep Learning]) during the Fall 2017/Spring 2018 semesters.
* The newly revised ABET criteria (<http://www.abet.org/accreditation/accreditation-criteria/cac-18-19/> - Version 2.0) have defined six required SLOs. These six SLOs align well with our existing ten SLOs. In order not to disrupt the current assessment process, we decided to not make changes at this time to the existing ten SLOs. We will adopt the newly defined SLOs after completion of the current 2012-2018 accreditation cycle.

# Constituency Member Comments

Constituency surveys are conducted every year. A few pertinent comments received over the last five years are given below:

***Industry Advisor Board Comments:***

## About PEOs & SLOs

* *The long term goal 3 to 5 years out are captured by the three listed objectives.*
* *A lot of the essential knowledge and skills come from the more advanced courses. Students should be encouraged to pursue an advanced degree.*
* *A strong foundation while in school should help the students with all the objectives and outcomes.*

## About the senior design program

* *The highlight of the curriculum is the Senior Design Sequence. It gives students a sense of real world business problems. It is also offers participating companies an opportunity to evaluate the next generation of employees.*

## About the senior design Expo

* *Outstanding job with the students and expo; enjoyed it very much; program delivery was better than at other universities.*
* *Extremely knowledgeable students; excellent student presentations; excellent communication skills.*

## About an individual senior design project

* *Congratulations PABOE Team on a great job of both creating our solution and making your presentation.  You accurately identified our business requirements, designed and developed a great software solution, and maintained the resolve to see it through.  Your ability to leverage cloud technologies testifies to your creativity and your vision of the future.  Your team was technically outstanding, and you worked very well together.*

## Senior design program suggestions

* *Seek projects connected to major trends such as machine learning/AI, cyber security, cloud architectures, cyber-physical systems, system resiliency.*
* *Encourage publications based on senior design projects.*
* *Include younger students and give them more elementary tasks. In later semesters they would be given more responsibility.*

## Other comments and suggestions

* *I am very glad you teach computer ethics. This is increasingly important as access to information increases and as we give devices more autonomy.*
* *Give students more experience setting up and using a complete development environment including: configuration management, alternative development methods (Agile, DevOps), bug tracking, versioning, build tools, continuous integration, and a formal release process.*
* *Encourage internships. Students should get more realistic work experience before graduating.*
* *Students could benefit from experience with legacy code issues, such as updating Fortran codes or using them with a more modern front end.*

***Faculty comments:***

## About PEOs

* *Make a change in tense to the past tense in the statements. They will then reflect objectives being met 3-5 years after graduation. i.e., (i) Change PEO #1 from "Students who enter...." to "Students who had entered....." (ii) Change PEO #2 from "Students who continue..." to "Students who had continued...."*
* *I'd suggest changing "new skills and new technologies" to "new knowledge and skills".*

***Alumni Comments:***

## Department/Curriculum

* *The computer science department did a fantastic job getting me ready for the real world. I received a solid foundation in theoretical and practical computer science. Very satisfied.*
* *I am extremely happy with the computer science education I received at CSULA. I find that I am prepared for every situation thrown at me.*
* *The curriculum has been invaluable for my career. I cannot give enough praise. Thank you.*
* *Because of my strong CSULA preparation I am continually given assignments that require learning new languages, tools, and frameworks.*
* *Professors continued to help me even after graduation. That led to my first freelance programming job, which along with my senior design project helped my get my current job.*
* *After ten years since graduation I have come to appreciate even more the CS Department, the CS program, and my experience there.*

## Comparison with co-workers

* *I find that I am able to perform at a level above many co-workers.*
* *I am able to look at problems and come up with multiple solutions. Most of my co-workers seem less able to do this.*
* *I feel that I have received a better education and was better equipped for my profession than my counterparts from other Cal State and UC schools. At first, I thought this was a fluke, but as my current employer hired more Cal State and UC graduates, this became a consistent observation.  CSULA's CS Program provided an important edge for me.*

## Possible improvements

* *I would have liked to have spent more time on algorithms as in CS 312 and to have had a class that specialized in JavaScript.*
* *More courses should include group projects.*
* *I would have liked more ways to engage with peers. A game lab where people can game and socialize would make a huge difference.*
* *My only negative experience with CSULA was when it changed from quarter to semester system as it delayed my graduation.*