



**COMMITTEE ON ACADEMIC PLANNING AND REVIEW
ANNUAL PROGRAM REPORT**

College	CoS
Department	Computer Science
Program	Undergraduate Computer Science
Reporting for Academic Year	2020-2021
Last 5-Year Review	2017-2018
Next 5-Year Review	2022-2023
Department Chair	Levent Ertaul
Author of Review	Varick Erickson
Date Submitted	10/01/2021

I. SELF-STUDY (suggested length of 1-2 pages)

A. Five-year Review Planning Goals

The Bachelors Computer Science goals from the last 5 year review included the following:

Curriculum:

- i. Implement semester-based courses as defined by transformed syllabi.
- ii. Assess semester-based courses and use data to continually improve courses.
- iii. Evaluate assessment mechanisms themselves to provide opportunity to improve mechanisms.
- iv. Regularly re-visit choice of programming languages and platforms used in introductory programming classes based on effectiveness shown by assessment data.
- v. Regularly evaluate possibility of seeking accreditation from Accreditation Board for Engineering and Technology (ABET., which provides accreditation for Computer Science programs.
- vi. Add new courses to address new fields or changes in existing fields in B.S. and M.S. degrees.
- vii. Increase the number of sections of introductory courses taught by tenured or tenure-track faculty.
- viii. Continue to increase lab elements and other participatory elements of classes.
- ix. Offer more on-line or hybrid courses to allow students more flexible schedules.
- x. Continue to offer new service courses in computing to other university departments.
- xi. Offer GE course in computing.

Students:

- i. Provide ongoing support for students who are continuing through the semester conversion.
- ii. Find funding or substitute for undergraduate advising role.
- iii. Improve student experience and B.S. graduation rate.
- iv. Reduce time to graduation for B.S. Students, both native CSUEB students and transfer students.
- v. Implement mechanisms to make student research projects available to student population. Use same mechanisms for internship experiences, peer advice, and references.
- vi. Work with AACE to increase recruiting on campus, both for graduates and students seeking internships.
- vii. Develop mechanisms for handling growth in undergraduate program and right-size graduate program to fit department resources.

Faculty:

- i. Recruit new faculty to reduce reliance on lecturers and to provide opportunities to offer classes and research support in areas of current Computer Science areas of development.
- ii. Encourage professional development.
- iii. Develop department by-laws.
- iv. Develop department leadership.
- v. Address workload of faculty, specifically four course per semester teaching load.
- vi. Address support for faculty supervision of student research.

Resources:

- i. Facilities for department faculty offices, teaching labs, research labs, including co-locating office space to provide opportunities for faculty to work together more easily.
- ii. Improve relationship with ITS (Instructional Technology Services) to support teaching and research needs.
- iii. Upgrade labs and environments used for class assignments, student research.
- iv. Address funding for readers, TAs, and travel to academic conferences.
- v. Address need for library resources, specifically to support graduate courses.
- vi. Continue to develop Industry Advisory Board

B. Progress Toward Five-year Review Planning Goals

The following are areas where significant progress was made:

Curriculum: The Department has successfully implemented semester-based courses as defined by transformed syllabi. CS101 is now taught in Python rather than C++. The undergraduate Computer Science committee continue to annually re-evaluate the choice of the language used in the introductory programming courses based on assessment data, pass rate, and other factors, to ensure that students are being provided the best learning experience possible. CS101 and CS201 now have lab components for the course.

For the past two years, CS101, CS201 and CS301 have been part of a program called Supplemental Instruction (SI). This program emphasizes active based learning activities that help support students with material from the course. Evidence has shown these programs to be beneficial to reducing DFW rates in courses for students who participate.

In addition to SI, learning assistants (LA) as also become an option for support. LA's are available for CS101, CS201, and CS301. The LA program offers peer mentoring and tutoring. In addition, the LA's assist instructors during class. For example, LA's can help coordinate in-class activities and assist with classroom engagement.

While Covid-19 has been extremely challenging, it has also allowed all faculty in the Department to develop online curriculum. We are discussing the possibility of having at least one section of each course be offered in an online format in the future.

We now also offer "CS170 - Cyber Security Awareness for Everybody: How to protect yourself in Cyber Space" as an Area E course.

Students: We have successfully graduated most of our students who started under the quarter system. For these few students who are still under the quarter catalog, we continue to use the articulation created during the semester conversion.

We have found funding for the undergraduate advising role through the Faculty Advising Fellow position which offers a course release. As this campus role is highly relevant to the position, this has proven advantageous. As long as the Faculty Advising Fellow position continues to offer a course release, the undergraduate advisor position can continue to exist to support our students. While other mechanism for advising may exist, the expertise of a tenure track faculty member is not easily replaced.

Overall enrollment in our B.S. Computer Science program has increased 31% from Fall 2016 to Fall 2020. The Department and campus firmly believe that advising is a key component to undergraduate success. Freshman students all now have dedicated advisors during their first year and have their schedules determined based on their major. In the future, this could potentially be transformed into a cohort-based program and help to build community. The undergraduate committee will be looking at such a program in the future. The Department is currently pursuing grants to support such a program and to help build community within the computer science student body. Transfer students are offered multiple opportunities each semester to attend CS specific orientation given by the CS Undergraduate Coordinator and Janet Snyder. The Department is continuing to hold regular undergraduate "Town Hall" meetings to get feedback from students and to increase the sense of community within the major.

Several faculty members have taken on a significant number of student research and capstone projects. Based on the policy set by the college of science, and conversations with the College of Science Dean and Assistant Dean, these faculty members will be able to receive a course release to support this student work.

Faculty: This past year, the Department attempted to hire one full time faculty member. Hongmin Li was hired as a new tenure track faculty member. Her expertise in Machine Learning and algorithms will be very beneficial to students and the Department. Xiaojun Ruan achieved tenure this past year. Varick Erickson has applied for tenure and promotion.

Resources: The Computer Science program needs resources such as technical laboratories and office space. Moving to the SF building was a positive experience, however, we worry that there will not be enough room for our new hires. In addition, we need a dedicated laboratory technician. We now have a new lab for Computer Networks and Network Security (CNNS) in VBT 218. We received funding to have an Extended AI Reality, AI, and Machine Learning Lab. However, we still require space to take advantage of this funding. This past year we received A2E2 grants for Internet of Things equipment and Parallel computing. This past year, we became a CISCO academy center as well as a AWS academy center. We have substantial CISCO and AWS training available for both faculty and lecturers.

C. Program Changes and Needs

Overview: The Department of Computer Science has a proven track record of success. Our graduated students are quite successful in Silicon Valley and in the national and international IT sector. In November 2014, The Washington Post reported that CSUEB Computer Science graduates were ranked #9 nationally in terms of career earnings, and ranked #7 nationally for the best rate of return for both in-state and out-of-state tuition. According to exit surveys done by AACE, Computer Science majors are the most successful of CSUEB graduates at finding degree-related employment within one year of graduation.

Undergraduate computer science student enrollment has increased by 31% between Fall 2016 to Fall 2021. While the Department did increase the number of fulltime tenure track faculty during this time from nine to thirteen, the growth of students has required the Department has continued to be dependent on lecturers. We are also facing space issues with regards to computer labs, teaching labs, and office space. We currently have part time technician that splits time between computer science and IT. We would like to eventually have this position support the computer science department full time.

Covid-19 is the most notable event that continues to affect the department year. This has caused significant strain on underrepresented groups. As many students have families and work part time in order to pursue their education, this has greatly impacted our student body. While our budget remains satisfactory, any cuts to the Department funding would affect the ability of Faculty members from completing research projects as this may affect the ability to have readers or TA's.

Despite this world changing event, enrollment has remained very strong. Faculty in the Department were able to transition well to the new online format given the circumstances.

Curriculum: The department is currently investigating retention of online teaching as part of the program in the long term. If our department decides to proceed, several courses will likely add Hybrid as an instructional mode.

Students: A significant number of students have been found to take courses without the required prerequisites. Given the linear nature of the material in Computer Science, this has lead to students receiving DFW's as they do not possess the required skills to complete upper division work. Currently, it is left to instructors to enforce perquisite courses. One notable prerequisite that needs to be enforced is CS301 – Data Structures and Algorithms. This upper division course

is foundational for many courses and cannot be fulfilled at a community college. Starting Fall 2021, the CS301 prerequisite is now automatically enforced for most upper division courses. We will be interested in seeing the effect on the DFW's rates in the future semesters.

Academic dishonest continues to be an issue. The current departmental policy states that students with an academic dishonesty report may not be graders and cannot take the Coop course. The undergraduate and graduate advisors meet with all students cited for academic dishonesty as well as with the Department Chair.

With regards to internships, we have started tracking student who take internships for credit. The following are the companies where students have done internships:

Summer 20	Fall 20	Spring 21	Summer 21
HCA Healthcare, PPMSI Division Bank of the West Tesla CircleHD, Inc GBR tek White Cloud Apps .01, Inc PayPal CSU East Bay - Information Technology Solutions MDout, Inc JDM Technology, Inc Wipro Technologies USA	White Cloud Apps BioForceTech Corporation	Pacific Northwest National Laboratory (PNNL) CSU East Bay - Information Technology Solutions	Questivity, Inc APATICS, Inc Apple ServiceNow Dropbox, Inc Saille Premier, Inc BioForceTech Corporation Integem, Inc

Faculty: Hiring continues to be challenging for the Department. The Department has been able to expand the pool of applicants by emailing professors at other institutions directly rather than rely solely on traditional job postings. While this strategy greatly increased the number of applicants, this also required a great deal of time for our administrative staff. This past year, the Department attempted to hire two full time faculty members. The Department extended two offers with one of the offers being accepted. Potential candidates consistently report that they were deterred from accepting our position due to the cost of living in the Bay area and CSUEB's compensation. We currently have 43% of our undergraduate sections taught by full-time tenure track faculty. The following are our current faculty members:

Name	Time Base
Brown, Kevin	1.0
Christianson, Leann	1.0
Derakhshandeh, Zahra	1.0
Daneshyari, Moayed	1.0
Erickson, Varick	1.0
Ertaul, Levent	1.0
Grewe, Lynne	1.0
Johnson, Matt	1.0
Li, Hongmin	1.0
Roohparvar, Farzan	1.0
Ruan, Xiojun	1.0
Yang, David	1.0
Zhong, Fay	1.0
TOTAL FTEF	13.0

Given the rapid growth of our program, even with the impact of Covid-19, it will be critical to hire more tenure track faculty. To do so, the Department may have to offer more competitive salaries. For the 2021-2022 academic year, we will have one full time faculty members on leave.

Staff: Administrative help is required by the Department. In the past, we have had funding to support student workers with various tasks. However, due to reduced funding we are unable to hire students for this purpose. Currently, coordination is being done at the college of science level to help support our office by adjusting roles and responsibilities within other offices on campus. This past year, Joshua Riva, left the department staff, leaving the department understaffed. We will need an additional staff member to meet student demand. With regards to

technical support, we no longer have access to a dedicated technician for our department. With the addition of the additional labs we have a critical need for a dedicated technician. Without a technician, we will not be able to support our labs and programs. Our staff members are as follows:

Name	Time Base	Shared With
Synder, Janet	0.5/0.5	Mathematics
Wiley, Stephanie	1.0	

To reiterate, we need additional staff to serve the approximately 1,000 students in our department.

Resources: Currently our classroom labs are N Sci 336, and a small room N Sci 104. While the number of computer labs are adequate now, the requirement for classes with computers has been increasing with the growth of the Department. Classes with lab components have also increase the demand for classrooms with computer labs.

The need for additional resources to fund readers, Teaching Assistants, and travel to academic continues to be critical for the Department. The lack of funding is especially an important factor as we attempt to hire new faculty who are especially in need of grading support and are expected to publish and present at conferences. There are indications that funding in the future may not allow for readers and teaching assistants due to the economic climate. This greatly impacts the ability of new tenure track faculty to pursue research.

Assessment: On 4/30/2019, the Department updated the 5 year assessment plan to align with new CSUEB established by the Academic Senate. The following is a summary of the PLO's/ILO's that will be assessed over the next 3 years:

2020-2021: PLO 3 (CS421)

2021-2022: PLO 4 (CS441)

2022-2023: PLO 5 (CS471)

Other: (e.g., major program modifications)

See previous comments regarding lab components.

SUMMARY OF ASSESSMENT (about 1 page)

A. Program Student Learning Outcomes

(No ILO alignment)

PLO 3 Employ current techniques, skills, and tools necessary for computing practice, and recognize the need for continuing professional development.

SLO 3 PLO 3 Compare and contrast the range of mechanisms that can be employed at the operating system level to realize concurrent systems

Program Student Learning Outcome(s) Assessed

Last year we evaluated PLO 2. This year we evaluated PLO 3.

B. Summary of Assessment Process

Instrument(s): *(include if new or old instrument, how developed, description of content)*
Average score on quiz.

Sampling Procedure:

Quiz was given to four sections of CS421 offered last academic year.

Data Collection: *(include when, who, and how collected)*

Instructor gathers results and sends them to the undergraduate assessment coordinator, Varick Erickson.

Data Analysis:

Assessment coordinator compiles the results in tabular form. This data is shared with the undergraduate committee for curricular changes, areas of concern, and general comment.

C. Summary of Assessment Results

Main Findings:

CS421 – Operating Systems (3 sections, 86 students)

This year Department assessed PLO 3, which was assessed in CS421.

	Total Samples	Average
F20, Section 1	26	83.1%
F20, Section 2	26	80.7%
Sp21, Section 1	30	60.0%
Sp21, Section 2	32	58.7%
All Sections	86	70.0%

Recommendations for Program Improvement: *(changes in course content, course sequence, student advising)*

Students did very well in the Fall 2020 semester with scores of 80.7% and 83.15%. The Spring 2021 semester, students did not do as well as the Fall 2020 (60.0% and 58.7%). This difference was most likely due to the mode of instruction. In the Fall, the sections were taught with fully synchronous online instruction. The Spring sections were taught primarily using asynchronous instruction with just a few synchronous sessions.

Next Step(s) for Closing the Loop: *(recommendations to address findings, how & when)*

For changes made to close the loop, new PLO's have been created for semester conversion. We have created standardized assessment quizzes for all required courses. Each quiz addresses a single PLO. With the assessments established, we plan to start looking for trends as data is collected and develop actionable strategies to address issues we find.

One area we are interested in examining is the effectiveness of the various modes of online instruction. Online instruction offers the benefit of reduced commute time and the ability of students to balance work with school. However, initial data suggests that the method of online instruction can greatly impact the learning effectiveness.

Other Reflections:

Based on anecdotal information, many students seem to greatly prefer online instruction. It allows for greater flexibility and give them more time to spend on study since the commute time is reduced. It also allows for potentially reduced cost as students can live in lower cost areas. This could potentially benefit URM's as most CSUEB students commute. However, there is still uncertainty regarding the effectiveness of online instruction. Over the next few years, a balance between online and on-ground instruction will need to be reached. We need to determine what best supports our students.

With respect to achievement gaps and graduation rates, we have made significant progress. Since 2011, we have reduced the GPA gap from 0.289 to 0.138. We also have increased our graduation rate by 44% as compared with the previous year. We are continually looking for ways to improve our program and remain committed to the CSU Graduation Initiative 2025.

Year	Average GPA Gap
2011-2018 QUARTER	0.289
2018-2020: SEMESTER	0.138

Admit Type: Native, Transfer

Degree Year	College	Department	Academic Career	Major Code	Major	Option Code	Option Description	Admit Type
2018-2019	Total	206						
	☐ Science	Total	206					
		☐ Computer Science	Total	206				
			☐ Undergraduate	Total	128			
			☐ Postbaccalaureate	Total	78			
2019-2020	Total	198						
	☐ Science	Total	198					
		☐ Computer Science	Total	198				
			☐ Undergraduate	Total	140			
			☐ Postbaccalaureate	Total	58			
2020-2021	Total	280						
	☐ Science	Total	280					
		☐ Computer Science	Total	280				
			☐ Undergraduate	Total	202			
			☐ Postbaccalaureate	Total	78			

(Source: Pioneer Data Warehouse)

Page 1 of 1

Run Date: 8/15/2021

D. Assessment Plans for Next Year

Summarize your assessment plans for the next year, including the PLO(s) you plan to assess, any revisions to the program assessment plan presented in your last five-year plan self-study, and any other relevant information.

Next year we will be assessing PLO 4. We will continue examine and revise curriculum and assessments based on the data gathered.

III. DISCUSSION OF PROGRAM DATA & RESOURCE REQUESTS *(suggested length of 2 pages)*

Each program should provide a one-page discussion of the program data available through University Dashboard. This discussion should include an analysis of trends and areas of concern. Programs should also include in this discussion requests for additional resources including space and tenure-track hires. Resource requests must be supported by reference to University Dashboard data.

Requests for tenure-track hires should indicate the area and rank that the program is requesting to hire. If a program is not requesting resources in that year, indicate that no resources are requested.

A. Discussion of Trends & Reflections Notable Trends;

Summarize and discuss any notable trends occurring in your program over the past 3-5 years based on program statistics (1-2 paragraphs). You may include 1-2 pages of supplemental information as appendices to this report (e.g., graphs and tables).

Reflections on Trends and Program Statistics:

Provide your reflections on the trends discussed above and statistics and supplemental information presented in this report.

We will continue to have problems in the future to find lecturers and/or tenure track faculty with PhDs and teaching experience if we are not able to offer suitable compensation to match market

demand for computer science and the high cost of living in the bay area. We run the largest MS program in COS, which brings ~3 million dollars to the university annually. For ABET and for our Department, the majority of undergrad CS courses should be taught by regular faculty with PhD degrees. All the MS CS courses must be taught by PhD holders. To sustain this standard, we need to hire more faculty. If we are unable to fill our tenure track positions, we will have to consider cutting our MS program.

B. Request for Resources (suggested length of 1 page)

1. Request for Tenure-Track Hires: provide evidence from trends provided

The Department request two tenure-track hires at the rank of assistant professor for the following reasons:

1. The Department of Computer Science will be asking once again for a new tenure-track hire line in 2020-2021 for the following reasons:
2. Enrollment in the CS undergraduate program has increased by roughly 10% this academic year, and many required CS courses have large waitlists. The Bureau of Labor Statistics predict 13% growth from 2016-2026. A new hire is therefore necessary to accommodate current and future student demand for the major. This would positively affect the graduation rates of our majors, as students would be able to enroll in the courses they need to graduate on time. It would also enable the department to offer better advising to all majors, thereby improving achievement gaps.
3. Due to the plethora of technology jobs in nearby Silicon Valley, it is extremely difficult – and often impossible – to find qualified temporary faculty to teach upper division or graduate courses in the discipline. It is therefore essential that we bring new tenure-track faculty members onboard.
4. In order to meet ABET accreditation standards, at least 50% of CS courses must be taught by tenure track faculty. This semester (Fall 2021), 43% of courses with the CS-prefix were taught by tenure-track faculty in our department. Given our student growth, we will need additional tenure track faculty members if we are to pursue ABET accreditation. To our knowledge, we are the only remaining program in Computer Science within the CSU that is not already accredited.
5. Faculty attrition has diminished our coverage of key areas in the discipline, and we have sharply curtailed many elective offerings in the major as a result. A new hire would allow us to align the department's curriculum and research efforts with emerging technologies. As a rapidly changing applied discipline, Computer Science must continually evolve in order to provide our graduates with key knowledge and skills demanded by industry.

2. Request for Other Resources

The Department of Computer Science faces a critical shortage of instructional computer labs. Computer Science is a laboratory discipline. While it is invaluable to have the CNNS lab and funding for the Extended AI Reality, AI, and Machine Learning Lab, we need continuing support to maintain these resources. We have a critical need for a dedicated technician to support these labs. Without the support of a technician these labs, we will be unable to utilize the space effectively in the long term. As previously mentioned, we still require a space for the Extended AI Reality, AI, and Machine Learning Lab. Without a dedicated space, we will be unable to utilize the funding to create a lab.

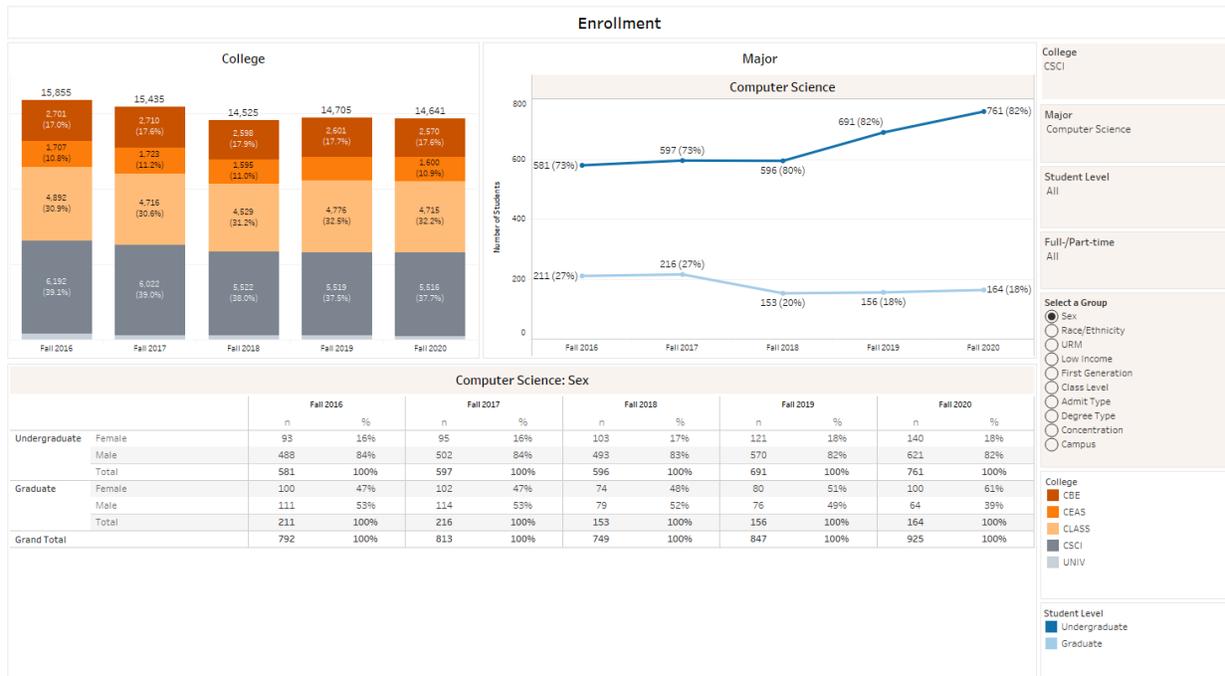
Most of our major courses need to have computers available in the classroom. Without the needed instructional labs, we are unable to deliver our curriculum. The department currently has almost 1,000 undergraduate and graduate majors, and enrollment is predicted to increase sharply for the next five years. We currently have only four computer classrooms available to support our program: NSCI 336, NSCI 104 (shared with Statistics), a small lab (25 seats), and the CNNS lab in VBT 218. Through the generosity of the College of Science, the department was able to create an open Computer Science Lab for students to use outside of the classroom in NSCI 337. As our outside reviewer mentioned, when we seek accreditation our relative lack of teaching and experimental lab space would be a major concern to the accrediting board.

Appendix

A. Undergraduate Student Demographics

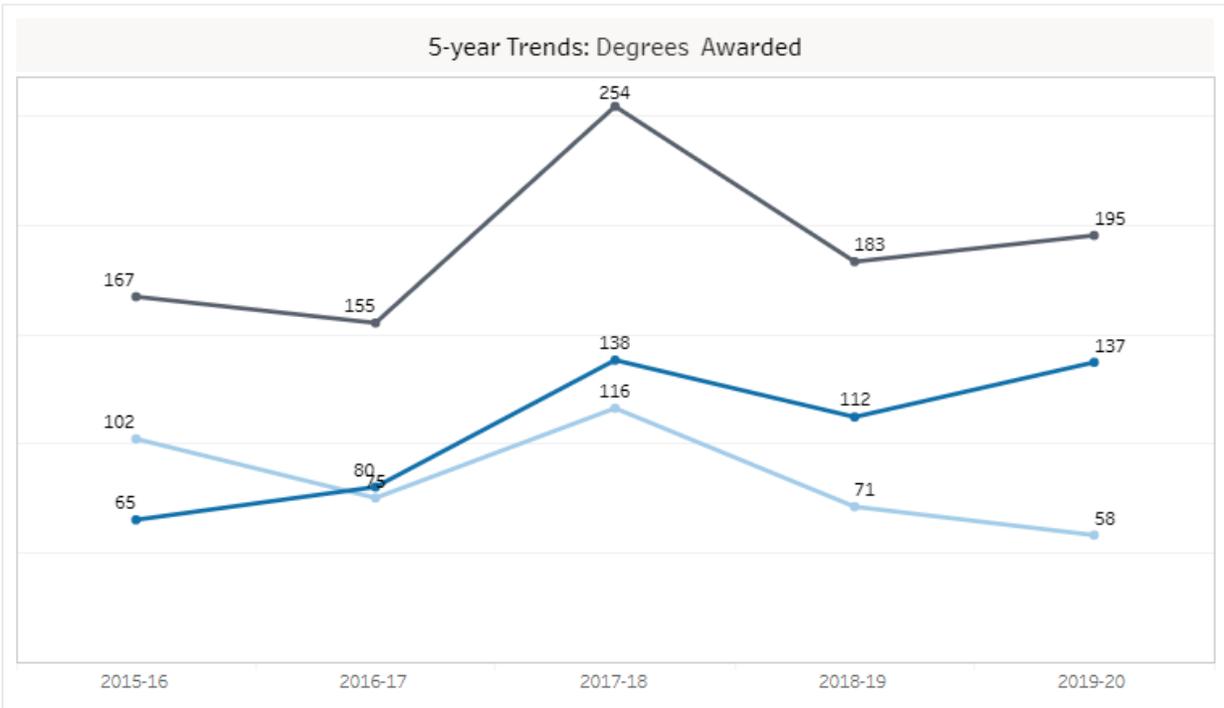
		Fall 2016		Fall 2017		Fall 2018		Fall 2019		Fall 2020	
		n	%	n	%	n	%	n	%	n	%
Undergraduate	Asian	216	37%	234	39%	215	36%	265	38%	300	39%
	Black	27	5%	36	6%	31	5%	30	4%	46	6%
	Hawaiian/PI	8	1%	4	1%	8	1%	4	1%	7	1%
	International	86	15%	79	13%	84	14%	80	12%	83	11%
	Latinx	112	19%	105	18%	116	19%	143	21%	150	20%
	Multirace	28	5%	26	4%	23	4%	25	4%	26	3%
	Native American					1	0%	1	0%	1	0%
	Unknown	16	3%	19	3%	26	4%	32	5%	36	5%
	White	88	15%	94	16%	92	15%	111	16%	112	15%
	Total	581	100%	597	100%	596	100%	691	100%	761	100%

B. Student Headcount



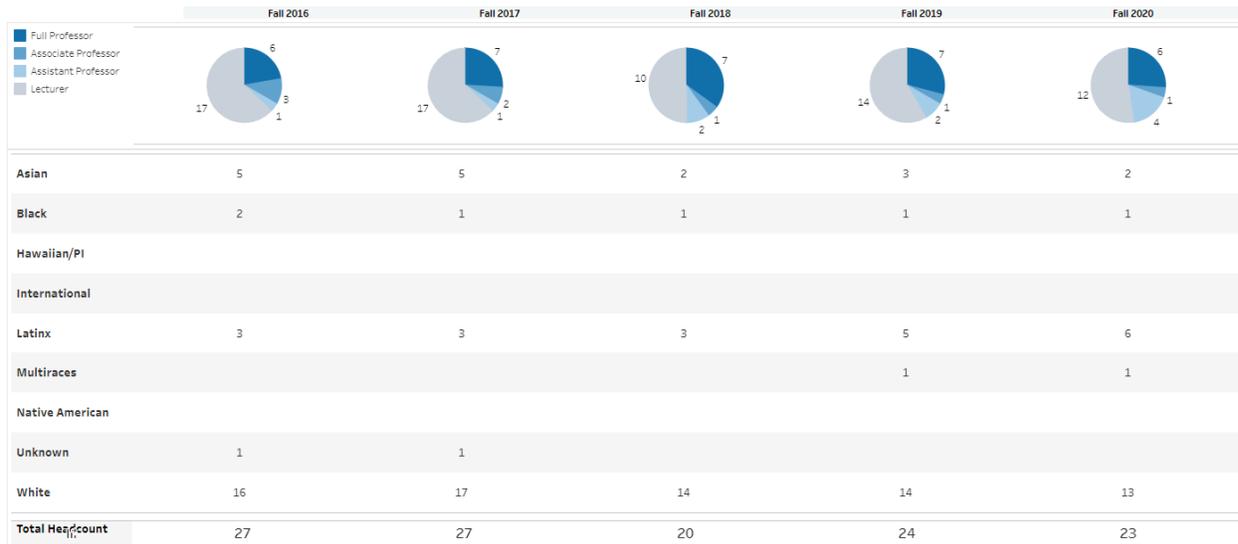
C. Degrees Awarded

Degrees Awarded	College Years				
	15-16	16-17	17-18	18-19	19-20
<i>Computer Science</i>					
1. Undergraduate	65	80	138	112	137
2. Graduate	102	75	116	71	58
3. Total Number of Majors	167	155	254	183	195



D. Faculty Information

			Term & Year		
			Fall 2018	Fall 2019	Fall 2020
F T E	Lecturer	FTE Proportion	28%	35%	40%
		FTE	4.87	6.33	8.33
	Regular Faculty	FTE Proportion	64%	61%	56%
		FTE	11.00	11.00	11.50
	Teaching Associate	FTE Proportion	8%	4%	4%
		FTE	1.33	0.80	0.80





E. Student Faculty Ratios

Course Level	Term & Year								
	Fall 2018			Fall 2019			Fall 2020		
	FTES	FTEF	SFR	FTES	FTEF	SFR	FTES	FTEF	SFR
Combined	5.0	0.2	29.9	18.3	0.3	56.2	6.8	0.1	68.0
Graduate	66.5	2.5	27.1	84.3	3.0	28.1	95.9	3.9	24.6
Lower-division	104.4	4.0	26.3	101.5	3.7	27.5	107.6	3.7	29.1
Upper-division	185.6	7.0	26.5	222.9	7.5	29.7	277.7	9.3	29.9
Total	361.5	13.6	26.6	426.9	14.5	29.4	502.0	17.2	29.2

F. Schedule Information:

	Enrolled	Waiting	Section Cap	Fill Rate	Term FTES	WTU
FALL 20	2566	53	2775	92%	502	243.9
FALL 19	2194	63	2349	93%	427	119.4
FALL 18	1974	65	2261	94%	361	183.5
FALL 17	1444	72	1621	89%	394	205.9
FALL 16	1392	21	1715	82%	389	226.0