Appendix A: TEMPLATE FOR ANNUAL PROGRAM REPORT REVIEW (See preceding document for detailed descriptions for each section)

ANNUAL PROGRAM REPORT

College	College of Science
Department	Computer Science
Program	M.S. Computer Science
Reporting for Academic Year	2022-2023
Last 5-Year Review	2022-2023
Next 5-Year Review	2027-2028
Department Chair	Levent Ertaul
Author of Review	Leann Christianson
Date Submitted	10/1/2023

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

A. Five-Year Review Planning Goals

Present your planning goals from your last 5-year plan.

The last 5-year review for the Department of Computer Science was conducted during the 2022-2023 academic year. The subsequent report was finalized in May 2023; therefore, we will refer to that report in this document. Our 5-year review lists new department goals for the following five years. These goals relate to the university goals of reducing time to graduation, increasing retention of students, and eliminating equity gaps. Goals are summarized by category here.

Curriculum:

1. To teach students the most important skills that are required by the industry
2. To educate students as unique individuals equipped with quality and depth of information in the diverse fields of computer science empowered by inspiring intellectual curiosity, critical thinking, and creativity
3. To prepare students for full and ethical participation in a diverse, multi-cultural society and encourage them to be lifelong learners who will contribute positively to the economic well-being of our region and nation
4. To prepare students to tackle complex 21st century challenges facing the world

Students:

1. Provide ongoing support for student advising at both the undergraduate and graduate level.
2. Improve student experience and B.S. graduation rate.
3. Reduce time to graduation for B.S. Students, both native CSUEB students and transfer students.
4. Implement mechanisms to make student research projects available to the student population. Use

same mechanisms for internship experiences, peer advice, and references.
5. Work with AACE to increase recruiting on campus, both for graduates and students seeking internships.
6. Develop mechanisms for handling growth in the undergraduate program and right-size the graduate program to fit department resources.

Faculty:

1. 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.
2. Encourage professional development.
3. Develop department bylaws.
4. Develop department leadership.
5. -

The MS Computer Science program continues to grow with 246 students enrolled (see Table 1). The degree offers two concentrations: Computer Science and Computer Networking. Both concentrations share five (15 units) of required courses with the remaining 15 units being electives and a capstone experience. The Computer Science concentration is currently the most popular among students with only 1 current student in the computer r Neim Tw -16.413 -1.141 Td [(de)-1.7 (g)10.9 (r)-3.9 (e)-1.7 n tci Nt yNTrhtro

increased each year. Statistics available from Pioneer Insights Fall 2018-Fall 2022 (see Table 1) show the graduate program growing from 153 to 246 students. We have made a modest move towards reducing numbers this Fall 2023. Currently, we have 203 students enrolled in our graduate program.

Students pursuing internships (CS 698) have been hired to work at the following sites: Tesseo Systems, Wanclouds, Perjury AI, Delisis Inc., Caterpillar Inc., Live Nation Entertainment, Magnit Global, Brave Spaces LLC, and Atmecs Global. Students in CS 698 complete a report on their internship experiences which is shared with all students. This way others can learn about internship experiences and the companies recruiting our students. Our department works with AACE to faci0uEtew(l)-4.w 18.9s (gs10.98 Tm [(W)-1.7

Staff:

All College of Science administration staff were combined into “Hubs” for the 2022-2023 academic year. We are sharing administrative staff with the engineering department.

Resources: (facilities, space, equipment, etc.)

Currently our classroom labs are SC N336, AE 0393 and a small room SC N104 which are all shared. They are just CS teaching Labs. With the growth of the Department that is 28% in last five year, the needs for adequate classrooms have been increasing. Specifically, classes with lab components have also increased the demand for classrooms with computer labs. Since we do not have adequate lab spaces, we are having difficulty with offering new courses such as XR, Deep Learning, and Introduction to Drones. Therefore, we need more instructional labs to offer those classes.

The department also needs more physical lab space for research. Currently, we have seven labs including the computer networks and network security lab (CNNS), XR lab, AI and deep learning lab, parallel computing lab, drone lab, IoT lab, and iLAB. We have more than 50 types of lab equipment including routers, sensors, GPU servers, XR headsets, drones, 3D printers, robotic arm, etc. However, we do not have any dedicated rooms for each lab, but only a small room in VBT 218 for the computer networks and network security lab, which is an instructional lab for teaching CS 441. We temporarily share space with other departments in SCS 125 to store our lab equipment for the other six labs. However, this lab will be converted to a classroom for another department to use starting next year. Therefore, we desperately need more lab space to store the equipment and to allow computer science faculty and more than 1,000 computer science students to work on their research projects.

The need for additional resources to fund graders, Teaching Assistants, and travel to academic conferences 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. This greatly affects the ability of new tenure-track faculty to pursue research.

These labs are up and running currently. Drs., Zahra, Moayed, Zhong, and Li were awarded an A2E2 grant in which funds will be used to improve an Extended Reality lab, Deep Learning Lab and Drones lab. however, space has not yet been allocated to the department for these labs to teach above courses.

To facilitate these labs the Computer Science department in needs of a dedicated Information Technology administrator. Our current administrator is shared with the faculty and programs of the College of Science and he is leaving this semester.

Other resources that would benefit the department include travel funds for research conferences and presentations, funds for student activities such as clubs and hackathons, funds for teaching assistants and graders, and funds for research equipment, software, and classroom needs.

Assessment:

Semester conversion allowed the department to standardize and organize assessment practices. Assessments were maintained and deployed through the Blackboard course management system. With the recent change from Blackboard to Canvas we must restructure the deployment of our

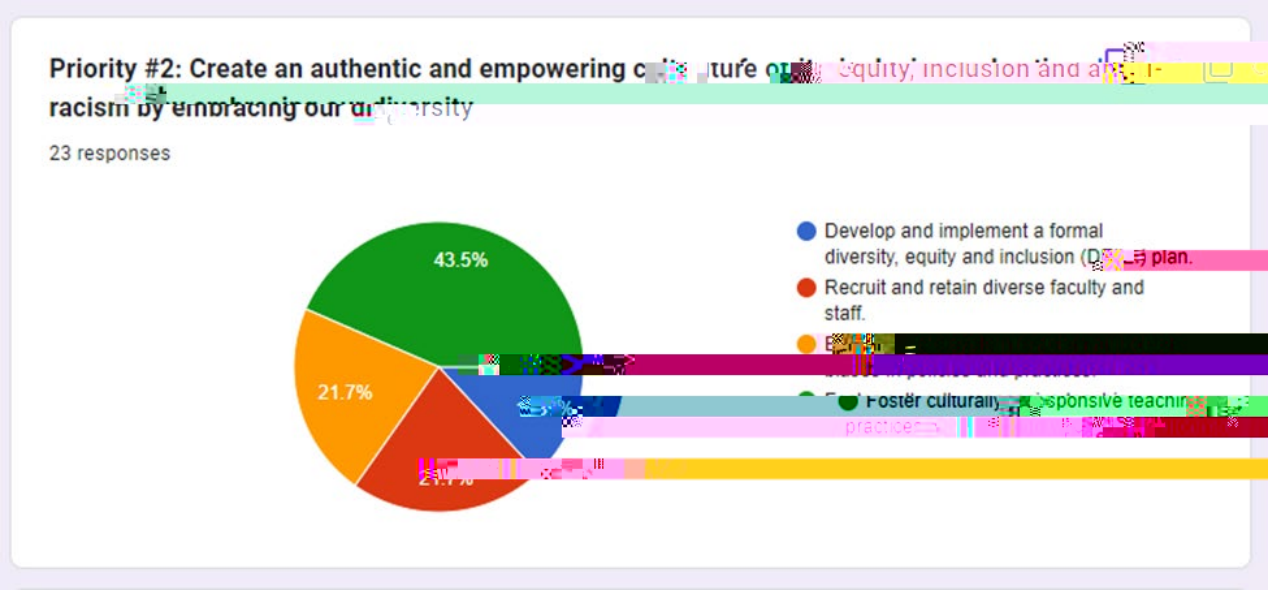
assessment tools. We have begun migrating our assessments to Google forms for ease of deployment and to aid evaluation over academic years. Our assessment process is addressed below in section II.

DEI Init iatives:

The DEI initiatives are focused on the undergraduate Computer Science courses. Please refer to the BS Computer Science annual report for a list of these initiatives and plans to address inequities.

3. Track Internships

Priority #2: Foster culturally responsive teaching practices and work environment.



Actions for Priority 2.

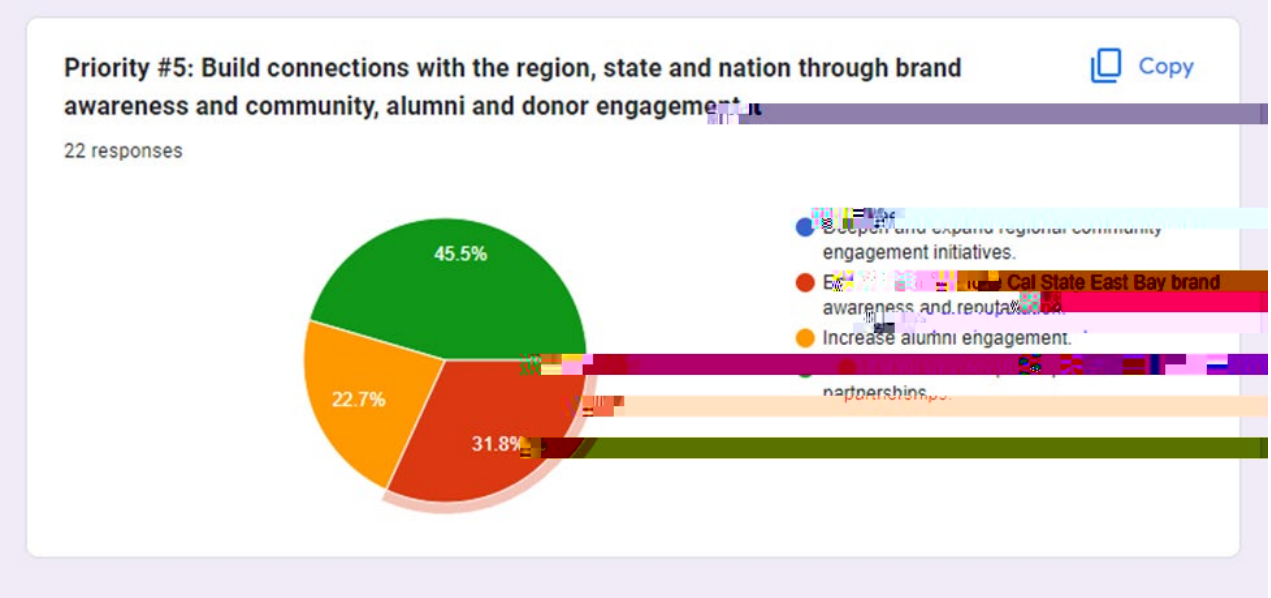
1. Maintain a list of online teaching/training workshops available for faculty and record which faculty members have completed which training, e.g., COS JEDI training programs.

2. Organize related workshops or discussions every year, e.g., organize an open house for CS faculty and students. This will be combined with the alumni or industrial board meetings when we invite alumni, industry guest speakers and students to participate.

Priority #3: Enhance infrastructure for research, scholarship and creative activity

Actions for Priority 3

1. Create a list of our research labs and equipment, e.g., the new security lab, XR lab, drone lab, AI/ML



Actions for Priority 5

1. Organize industrial board and advisory board meetings
2. Organize on campus CS alumni events
3. Organize small group site visits to local companies
4. Reach out to local companies to create partnerships

In the coming years, the CSUEB CS Department will implement the above action plans for its priorities.

II. SUMMARY OF ASSESSMENT (suggested length of 2-1 pages)

A. Program Learning Outcomes (PLO)

List all your PLO in this box. Indicate for each PLO its alignment with one or more institutional learning outcomes (ILO). For example: "PLO 1. Apply advanced computer science theory to computation problems (ILO 2 & 6)." Program Learning Outcome(S) Assessed: List the PLO(s) assessed. Provide a brief background on your program's history of assessing the PLO(s) (e.g., annually, first time, part of other assessments, etc.)

PLO1 Apply knowledge of mathematics and computational theory to analyze problems in computer science and assess and determine the resources and requirements needed for their solution.

ILO1 : Quantitative Reasoning

ILO2 : Communication

Class Assessed: CS 611 Theory of Computation – 2023-2024

PLO2 Design, develop, and evaluate a computer-based system, process, component, or program to meet desired needs.

ILO1 : Quantitative Reasoning; ILO4: Collaboration

Class Assessed: CS 651 Web Development 2024-2025

PLO3 Classify and explain the mechanisms, components

and architecture of computing systems.

ILO1 : Quantitative Reasoning

Class Assessed: CS 621 Operating System – 2025-2026

PLO4 Employ current techniques, skills, and tools

necessary for computing practice and justify the need for continuing professional development.

ILO1 : Quantitative Reasoning

Class Assessed: CS 601 Advanced Algorithms 2026-2027

PLO5 Discuss professional, ethical, legal, and security

issues and responsibilities, and the impact of computing on individuals, organizations, and society.

ILO1 : Quantitative Reasoning

ILO2 : Communication

Class Assessed: CS 601 Advanced Algorithms 2027-2028

PLO6 Function successfully on teams to accomplish a

common goal and explain computer science concepts effectively in written and oral form.

ILO1 : Quantitative Reasoning

ILO2 : Written Communication

Class Assessed: CS 671 Cybersecurity 2028-2029

B. Summary of Assessment Process

Summarize your assessment process briefly using the following headings

Instrument(s):

We assess the Computer Science program in five courses that are required for all students.

These

The assessment scores are in the 85th percentile and above which is well above the 60th percentile chosen for proficiency. We are happy to see our students are mastering the concepts aligned with our program learning outcomes in these important required courses.

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

Currently, we do not see a need to change course content, sequence or advising. However, a more convenient and consistent method of deploying the assessments and gathering data is needed.

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

Our results were positive and show that students are learning content aligned with our PLOs in the classes assessed. Findings will be disseminated to the department graduate committee and then to the department at large.

Other Reflections:

We are investigating more convenient and automatic way of deploying and collecting assessment results. We also would like to compare the effectiveness of in-person, online, and hybrid instructions.

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 self-study, and any other relevant information.

In the next academic year, we will assess PLO 1 "Apply knowledge of mathematics and computational theory to analyze problems in computer science and assess and determine the resources and requirements needed for their solution." This PLO maps with the ILOs of Quantitative Reasoning and Communication. The class assessed will be CS 611 Theory of Computation.

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.
Enrollment Trends

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).

Enrollment has increased in the MS Computer Science program from 2017-2022. Numbers have grown from 153 in 2017 to 246 in 2022 (Table 1). As graduate courses require PhD instructors and with three faculty retiring, we are facing a faculty shortage and will need to shrink the program. The computer Science concentration is favored by the majority of the students (Table 2 and Table 3). We are seeing an increase of male students and a decrease in female students (Table 4). As has long been the trend, 95% of our graduate students identify as International with 4% Asian, 1% Latinx, and 1% White (Table 5). International students require more resources for advising due to immigration policies and procedures. First generation graduate students are few at 5% (Table 6). We would like to see this number increase through recruitment from our undergraduate program and through our presence at other graduate student informational events.

Reflections on Trends and Program Statistics:

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

With both BS and MS programs growing, 28% in the last five years, and three faculty retiring, our department is in dire need of new hires. The CS department faculty has one of the highest Student Faculty Ratio in the College of Science. The department plans to continue to request new positions in the department and carry out searches to secure new faculty members for the department. However, hiring new faculty became a bit challenging because of the low salary offers.

The department will continue to do extensive outreach to local universities and universities that serve under-represented groups, and recruit at conferences and other events where possible. The department is currently conducting a search for one tenure-track faculty member during the 2023-24 academic year. In every university survey, local or system wide, it has been shown that faculty salaries and workload issues are the top two issues faced when trying to hire new faculty. That is why we requested a 20% at least increase in our compensation for TT faculty candidates compared to last year's accepted offer. In the last five years we were never able to hire any CS TT candidate who were in the top 2

use outside of the classroom in SC N337. As our external reviewer mentioned, when we seek accreditation our relative lack of teaching and experimental lab space would be a major concern to the accrediting board.

When it comes to research labs, the department needs more physical lab space, since we don't have any CS dedicated lab spaces but only shared spaces with other departments. Currently we have seven labs, include the Computer Networks and Network Security lab, XR lab, AI and Deep Learning lab, Parallel Computing lab, Drone lab, IoT lab and iLAB. We have more than 50 types of lab equipment including routers, sensors, GPU servers, XR headsets, drones, 3D printers, robotic arm, etc. We need more lab space to store the equipment and to allow faculty and students to work on their research projects.

The department is currently involved in discussions with the Dean of the College of Science in order to address the lack of teaching lab space. It seems that CS will have yet another shared lab space in this new science building. This could be enough for some research activities but it is not definitely enough to teach XR and Drone classes for example. We need permanent, Computer Science only, teaching labs.

In addition to the lack of space, the Computer Science Department is the only department in the College of Science and in all of the CSU and UC CS departments that does not have its own technician. The technician that IT has designated to the CS department is shared by all of the departments within the College of Science, and that technician is leaving this semester.

Since we have the labs mentioned above, the department needs physical teaching and research space for faculty and students as well as a dedicated technician who will support teaching and research activities for CS students and faculty.

We continue to work with ITS (Instructional Technology Services) to support teaching and research needs. Centralization of equipment by ITS has proven to be a serious concern, impacting both teaching and research goals of the department. Servers supporting student work and necessary for teaching classes in Database Administration, Network Administration, Network Design and the like have been taken from departmental control. These servers have either not been replaced at all or have been replaced with virtual counterparts which provide much less functionality than the originals. For instance, BayCloud virtual images has been suggested as a temporary solution, but it does not provide the functionality needed in the long term. The department is having discussions with ITS to attempt to find solutions to this problem.

Table 1– Enrollment Computer Science Fall 2018-2022

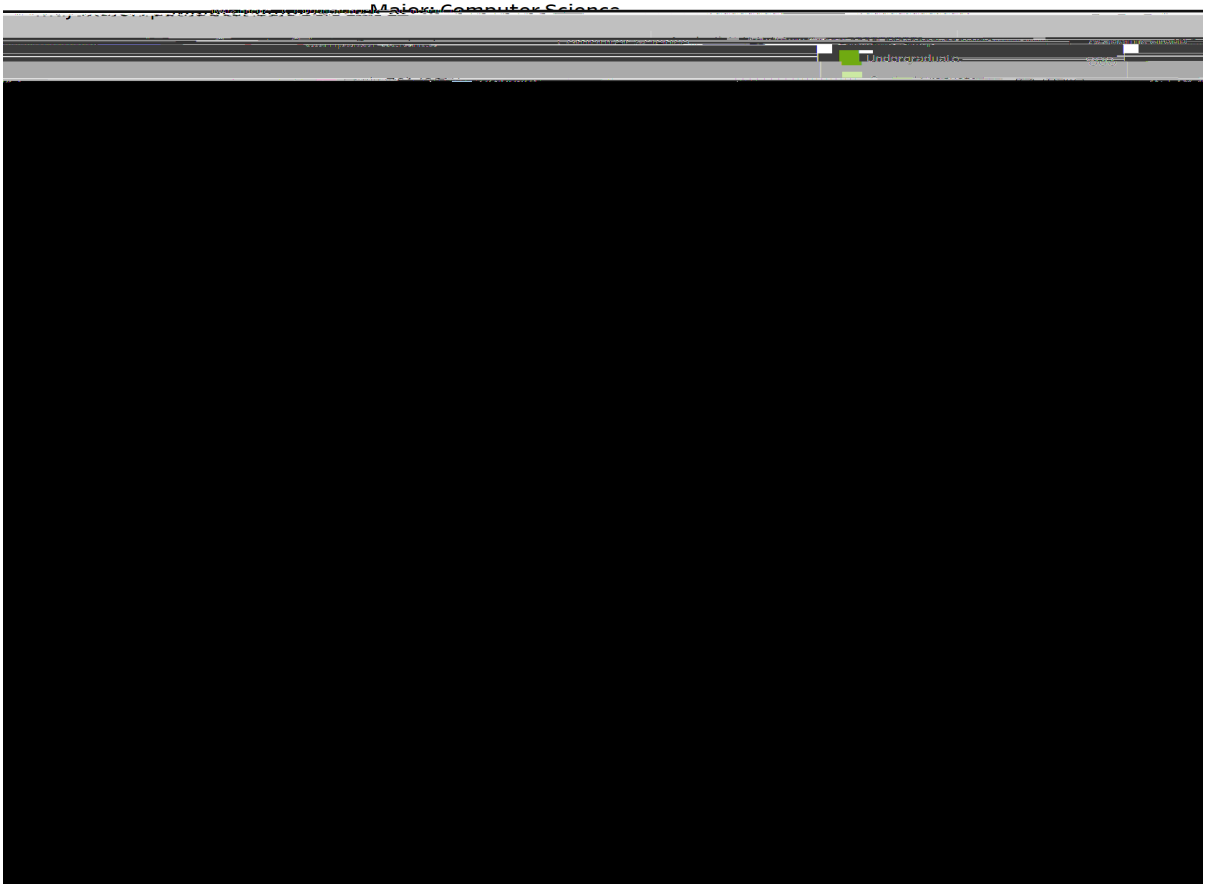
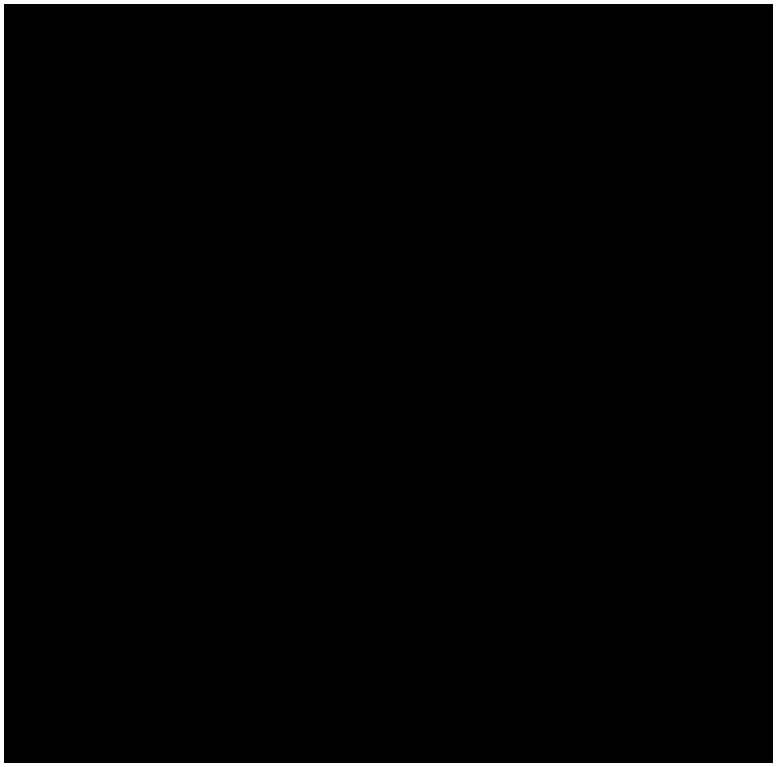
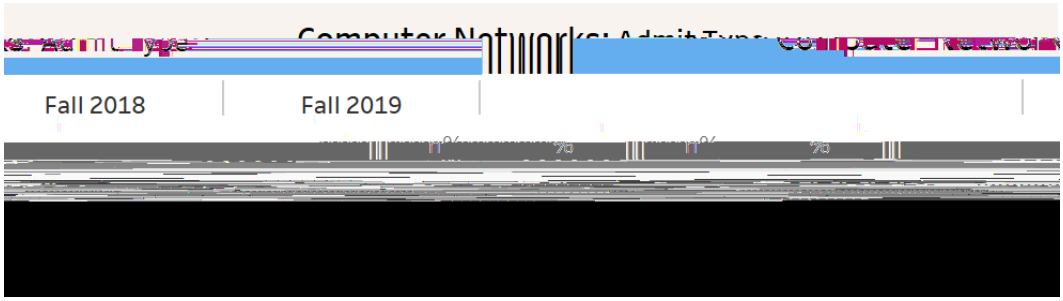


Table 2 Fall 2023 Enrollments MS Computer Science – Computer Science concentration

		Fall 2018		Fall 2019		Fall 2020		Fall 2021		Fall 2022	
Undergraduate			94%	675	98%						
	Computer Engineering	7	1%	2	0%						
	Networking & Data Communic	4	1%	3	0%	2	0%				
	Software Engineering	24	4%	11	2%		1%	2	0%		
	Total	596	100%	691	100%	76	100%	741	100%	763	100%
Graduate		117	76%	73	47%	41	25%	33	15%	1	
	Computer Science	32	21%	80	51%						
	Total	153	100%	156	100%	164	100%	221	100%	246	100%
Postbaccalaureate											100%
	Total									2	100%
Grand Total		749	100%	847	100%	925	100%	962	100%	1,011	100%

Table 3 MS Computer Science Network Concentration 2018-2019





Graduation/Degree Data

Table 7 Computer Science Admit Type

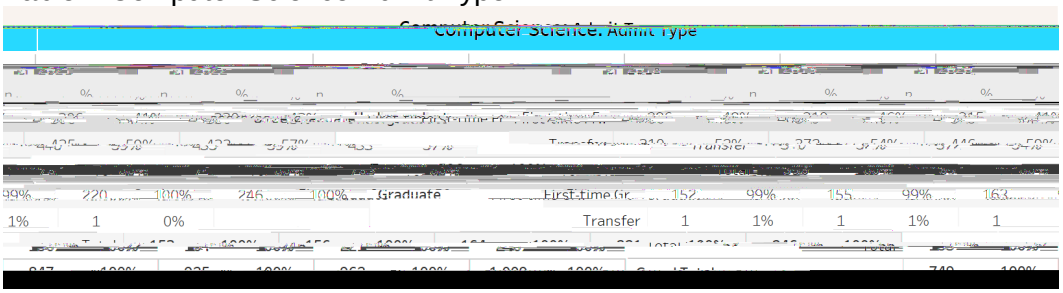


Table 8– Computer Science Class Level

Table 9 Computer Science Time to degree

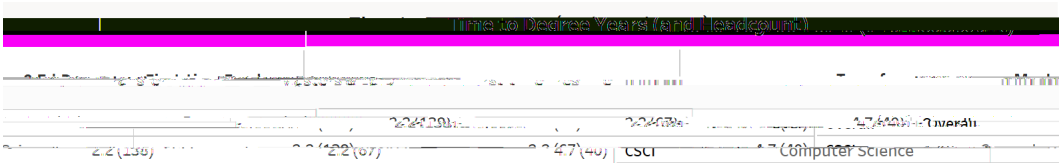
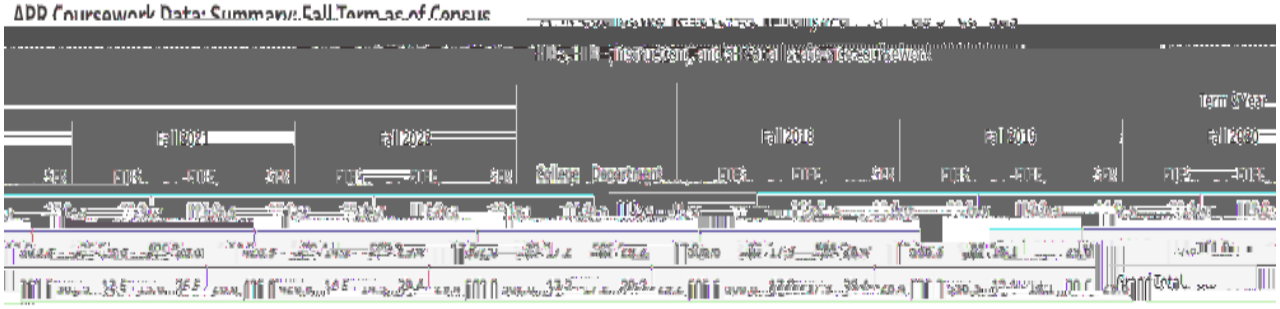



Table 10 APR Coursework Data Summary at census – BS degree only