

**ASSESSMENT DATA ANALYSIS AND UPDATED PLAN**

**FOR**

**(PROGRAM NAME)**

**(ACADEMIC YEAR)**

**I. MISSION & HISTORY**

1. **Describe the history and development of your program.**

The AU Computer Science program is now part of the School of Business and offers a B.S. degree and minor in computer science. It was once a large department that had two tracks, a B.A. and a B.S. degree option. The department went into severe decline, and there were fewer than 15 majors as late as 2011. Current trends in technology had left a program that was significantly lacking skills that graduates need. This decline was evidenced both in the difficulty students were having getting jobs, based on lack of skill set, as well as assessment of our program. Between 2011-2015, major changes were implemented to revive the program. These changes helped to create a focused and relevant identity, and were designed to improve the quality of the program as well as add relevancy to the current field of computer science. Courses were added to enhance the breadth of knowledge our graduates will receive as well as removed where they were inconsistent with current trends and needs, and prerequisites were changed to allow for a more consistent path through the program. These changes have produced tremendous growth in the number of majors that has averages 8.5% per year for the last 5 years. Throughout this growth, the program faced a complete change-over of instructors and 4 different department heads and Deans in the last 4 years.

Computer Science is an area that changes at the speed of light, and departments must be willing to change with the technology, always seeking to provide opportunities for students that will be respected in industry. Recent program highlights are listed.

* The first programming course CS 1700 will focus on the programming Language Python started last year so that students who take only one programming course will have all of the foundations of programming.
* New courses CSC 4100 System Analysis and Design and CSC3150 (Software testing) have been added to the curriculum to enhance the software engineering options.
* Student expectations and outcomes have been increased in CSC4350 (Software Engineering), CSC4990 (capstone) and CSC2200 (Web Application development).

The last major revision to the computer science curricula occurred in 2013, when AU transitioned to the four semester hour model. This had a significant impact on the department, since most of the courses were three credit hours. While the changes meant more time per course for a deeper understanding of the content, the loss of a course meant that AU CSC graduates have less core coursework than other universities. Some CSC students struggle to find good development jobs in field with high demand for candidates. As such, an on-going effort is underway to strengthen the core CSC coursework and electives.

* CSC1700 (Introduction to Programming) now requires students to master the Python programming language so that they learn at least 2 programming languages during the program.
* The required CSC2200 requires evidence of mastery of programming fundamentals that includes a student programming project and a larger percentage of final exam.
* The programming requirements for the required CSC3610 (Data Structures) have increased from past years.
* The required CSC4350 (Software Engineering) now includes content to add key technology mastery along with most of its previous concepts.
* In addition, new courses CSC 4100 System Analysis and Design, and CSC3150 (Software testing) and Programming Languages have been added to the curriculum to enhance the software engineering options.

1. **What is the mission statement of the program, and is it visible for students to see (i.e. on your academic website and in written materials)?**

The mission of the Computer Science program at Aurora University is to pursue teaching, research and service in the computing sciences. The program provides an environment where students can develop a breadth of knowledge across the subject areas of computer science, including their ability to apply computer science theory, abstraction, design, and implementation to solve problems in the discipline. It will also contribute to the development of students as critical thinkers, enabling them to become lifelong learners, to continue to grow in their chosen professions, and to function as productive citizens.

The computer science program goal matrix highlights the educational outcomes, which align with the standards of ABET (Accreditation Board for Engineering and Technology).

1. **How does your mission fit with Aurora University’s institutional mission statement?**

In pursuing our mission, the primary departmental functions are the development, dissemination, and application of knowledge in the area of computer science. We serve students who are our majors and minors, and those from other service areas. In fulfilling this mission, the department creates an environment where the faculty can continue to grow as teachers and scholars, while providing public and professional service.

As students make progress though the computer science curriculum and continue reaching these goals, they see the four core values (integrity, citizenship, continuous learning, and excellence) throughout their instruction. Students majoring in computer science will understand and be able to apply the concepts and techniques that are foundational to contemporary computer science. They will have an appreciation of computer science, its history, and its role in the modern world and learn how to formulate algorithms and create programs. They will demonstrate skills appropriate for careers in business and industry, or for further study at the graduate level.

The mission, together with the program goals, clearly demonstrates that the Computer Science Department is part of an “inclusive community dedicated to the transformative power of learning,” as AU’s mission states.

1. **In what ways is your program essential to the University?**

Computer science based careers continue to be an economic driver for our country and an opportunity for AU to educate students interested in this area. The computer science program has continued to grow at 8.5% per year. This increase in enrollment paralleled robust requirement changes for students earning a B.S. in Computer Science. Additionally, the “T” in STEM is often associated with this content area. Therefore, critical to building a solid reputation in STEM includes fostering computer science and demonstrating a university commitment to its success.

1. **What kinds of strategies do you use to engage students, especially at-risk and non-traditional students?**

The Department of Computer Science has implemented several strategies to engage students of diverse backgrounds, and to help those in need of academic assistance.

1. The department encourages high performing students to participate in peer tutoring opportunities.
2. The department has a senior reception in May to honor the graduating students. All students and faculty are invited. Department awards for academic excellence in each major are presented.
3. In order to foster relationships between current and former students, alumni are asked to return to AU to present talks to current students.
4. Students are offered internship opportunities.
5. Students are offered independent study opportunities.
6. A conscious effort is made by faculty to be readily available to assist students with content, as well as with course selection and career objectives. Implementation of the junior mentoring program will further engage students and faculty in conversations beyond college.
7. The Computer Science Club offers problem solving practice sessions allowing students to practice common coding and interview problems.
8. **How would you describe the maturity and visibility of your program?**

The department embraces its responsibility as a STEM constituency, a program with a major and minor, and a provider of service courses. The assessment in all three of these areas is crucial to the evaluation of the department as a whole. Some of our majors are engaged in both the department and AU, are receiving good job offers, and are being accepted into reputable graduate programs. Others struggle to find work in a field with near 100% employment (even through the pandemic). As stated previously, the program has seen tremendous growth and high change in facility and leadership. Through this time, we have completed efforts to:

1. Align the curriculum with courses that need to be completed
2. Strengthen the outcomes of the core Computer Science curriculum to better align with the skills and abilities required in the job market.
3. Establish and direct the Computer Science club to support programs that help students succeed and earn job opportunities.
4. Add and redesign courses to meet the needs of the ever-changing computing world. For example, CSC4350 (Software Engineering), CSC4500 (database) and CSC4990 (Capstone) now have content that requires students to learn technologies in demand in the job market.

More effort is needed to

1. Ensure the core-curriculum continues to produce better outcomes for skills students need.
2. Better align the CSC elective offerings with student career prospects.
3. Ensure students learn and embrace the expectations of the job-market and develop skills needed to succeed in that market. In particular, many high-tech employers require candidates to complete exams, on-the-spot problem solving and answer deep technical problems during interviews. Our program needs to reflect that reality and better prepare students for these events.
4. Fine tune the program outcome to produce more actionable data for the program.

**II. PRIOR YEAR DATA ANALYSIS & PROPOSED PROGRAMIC CHANGES**

**WRITING INITIATIVE**

For your Writing Across the Disciplines (Writing Initiative) data, provide a BRIEF summary and analysis of the data presented in the Assessment Data Report.

1. **REFLECTION UPON DATA DEMONSTRATING ACHIEVEMENT OF WRITING** – Did your students demonstrate expected growth from the lower level to the upper level writing-intensive courses you assessed? Did students perform equally well on each element of the University rubric for writing? If not, what is your assessment of factors contributing to the differences?

**TODO**

1. **REFLECTION UPON ACHIEVEMENT OF WRITING OUTCOMES ACROSS PROGRAM LOCATIONS AND INSTRUCTIONAL MODALITIES –** Did students perform equally well on each element of the University rubric for writing across campus locations (Aurora, Woodstock, GWC) and instructional modality (On-Ground, Online)? If not, what is your assessment of factors contributing to the differences?

Computer Science is currently only offered in Aurora.

1. **PROPOSED PROGRAM/CURRICULAR CHANGES RELATED TO WRITING** - Changes you plan to make to your curriculum, teaching methods, or course assignments to improve this learning outcome, as well as when these changes will be implemented.
2. The writing assignment in CSC4350 (ethics paper) was a good writing assignment but it caused the course to drift too far from its main outcomes. As a result, students demonstrated deficiencies in other areas critical to the CSC4350. For example, during CSC4990 (Capstone) students had trouble developing requirements and test plans. We should consider changing this writing assignment to something more central to the course.
3. **REFLECTIONS ON EVIDENCE OF EFFICACY OF PRIOR PROGRAM/CURRICULAR CHANGES (N/A for 2020-2021 – will be applicable for 2021-2022)**

**UNIVERSITY LEARNING OUTCOMES**

For each of the other University Learning Outcomes (Critical Thinking & Oral Communication), provide a BRIEF summary and analysis of the data presented in the Assessment Data Report.

1. **REFLECTION UPON DATA DEMONSTRATING ACHIEVEMENT OF UNIVERSITY LEARNING OUTCOMES** – Did students perform equally well on each element of the University rubrics? If not, what is your assessment of factors contributing to the differences?

Critical thinking is a base requirement in almost every computer science course. Both effective communication and critical thinking are assessed through our program outcomes.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Computer Science and Cybersecurity ABET Outcomes** | **Program Outcome** | **Effective Comm.** | **Critical Thinking** |
| (a) | An ability to apply knowledge of computing and mathematics appropriate to the discipline | PO#1 |  | **X** |
| (b) | An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution | PO#3 |  | **X** |
| (c) | An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs | PO#3 |  | **X** |
| (d) | An ability to function effectively on teams to accomplish a common goal | PO#2 | **X** |  |
| (e) | An understanding of professional, ethical, legal, security and social issues and responsibilities | PO#4 | **X** | **X** |
| (f) | An ability to communicate effectively with a range of audiences | PO#2 | **X** |  |
| (g) | An ability to analyze the local and global impact of computing on individuals, organizations, and society | PO#3 |  | **X** |
| (h) | Recognition of the need for and an ability to engage in continuing professional development | PO#4 |  |  |
| (i) | An ability to use current techniques, skills, and tools necessary for computing practice | PO#1 |  | **X** |
| (j) | An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices | PO#4 |  | **X** |
| (k) | An ability to apply design and development principles in the construction of software systems of varying complexity | PO#3 | **X** | **X** |

1. **REFLECTION UPON ACHIEVEMENT OF UNIVERSITY LEARNING OUTCOMES ACROSS PROGRAM LOCATIONS AND INSTRUCTIONAL MODALITIES –** Did students perform equally well on each element of the University rubrics across campus locations (Aurora, Woodstock, GWC) and instructional modality (On-Ground, Online)? If not, what is your assessment of factors contributing to the differences?

Computer Science is currently only offered in Aurora.

1. **PROPOSED PROGRAM/CURRICULAR CHANGES RELATED TO UNIVERSITY LEARNING OUTCOMES** - Changes you plan to make to your curriculum, teaching methods, or course assignments to improve these learning outcomes, as well as when these changes will be implemented.

Critical thinking and effective communication are an important part of the university and CSC overall outcomes. Because of the nature of the CSC discipline, critical thinking is well represented throughout the curriculum. We could consider emphasizing and assessing effective communication more during CSC4990 (Capstone) in particular to:

Computer Science needs to continue to strengthen verbal outcomes in the required courses. In particular:

1. Require regular verbal status reports completed by different team members throughout the semester with specific feedback on their content and communication abilities that they demonstrated. A specific set of rubrics should be developed for these assignments.
2. Consider adding individualized verbal reports from teams that covers their contribution and specific technology learning in the course. A specific rubric should be developed for this assignment
3. Change the writing assignment during CSC4350 to a requirement specification rather than an ethical dilemma.
4. **REFLECTIONS ON EVIDENCE OF EFFICACY OF PRIOR PROGRAM/CURRICULAR CHANGES**

The following lists the proposed changes and reflections

Computer Science needs to continue to strengthen outcomes in the required courses. In particular:

1. ***CSC1700 and CSC2650 need to standardize expected outcomes and abilities.*** This item was not completed and should be considered fo the following year.
2. ***Additional writing assignments have been added in CSC2300 and CSC4350 that required a draft and completed paper. New and more specific rubrics have been added to CSC4350 to assess team-work and individual communication abilities.***

TBD

1. ***A specific, individual ethics assignment is now required in CSC4350.***  This paper has already assessed this change in the above analysis.

**GENERAL EDUCATION LEARNING OUTCOMES**

If your program taught any courses eligible to award General Education distribution credit, provide a BRIEF summary and analysis of the data presented in the Assessment Data Report for each distribution category / course combination.

1. **REFLECTION UPON DATA DEMONSTRATING ACHIEVEMENT OF GENERAL EDUCATION LEARNING OUTCOMES** – Did students perform equally well on each element of the University rubrics? If not, what is your assessment of factors contributing to the differences?

N/A

1. **REFLECTION UPON ACHIEVEMENT OF GENERAL EDUCATION LEARNING OUTCOMES ACROSS PROGRAM LOCATIONS AND INSTRUCTIONAL MODALITIES –** Did students perform equally well on each element of the University rubrics across campus locations (Aurora, Woodstock, GWC) and instructional modality (On-Ground, Online)? If not, what is your assessment of factors contributing to the differences?

N/A

1. **PROPOSED PROGRAM/CURRICULAR CHANGES RELATED TO GENERAL EDUCATION LEARNING OUTCOMES** - Changes you plan to make to your curriculum, teaching methods, or course assignments to improve these learning outcomes, as well as when these changes will be implemented.

N/A

1. **REFLECTIONS ON EVIDENCE OF EFFICACY OF PRIOR PROGRAM/CURRICULAR CHANGES (N/A for 2020-2021 – will be applicable for 2021-2022)**

N/A

**PROGRAM LEARNING OUTCOMES**

For each Program Learning Outcome in the Program Assessment Plan, provide a summary and analysis of the data presented in the Assessment Data Report.

\*Please identify one or more learning outcomes as targets for improvement / further development in the coming year and describe your plans for promoting improved achievement of that learning outcome / those learning outcomes in the coming year.

**OUTCOME 1**

|  |  |  |
| --- | --- | --- |
| Computing/Mathematic Knowledge | PO1: Identify and analyze computer based systems, processes or components. Utilize their education to contribute critical and systemic thinking while recognizing ethical responsibilities | (a) An ability to apply knowledge of computing and mathematics appropriate to the discipline  (i) An ability to use current techniques, skills, and tools necessary for computing practice. |

**ASSESSMENT DATA FOR OUTCOME 1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **What data sources were used** | **When were data collected** | **Indicator** | **Percent of students earning good or exemplary** | **2020-2021** | **2019-2020 Mean (sd)** | **2018-2019 Mean** | **2017-2018**  **Mean** |
| CSC4990 capstone project | Spring 2021 | a | 81 | 3.85 (.75) | 3.2 (0.92) | 2.89 | 3.04 |
| CSC4500 project | Fall 2020 | i | 100 |  | 3.73 (0.45) | n/a | n/a |

1. **NARRATIVE SUMMARY FOR OUTCOME 1** –

Overall the data seems to indicate that students meet this benchmark overall. Based on how we measure these POs its difficult to determine if students

Still the overall PO needs refining and more specifics. Specifically, we should change this PO to the following:

|  |  |  |
| --- | --- | --- |
| # | PO | As Measured By |
| PO1 | Create and evaluate solutions to computing problems that with a complexity required by industry. | We should select a specific student project in CSC4500 to judge this outcome. |
| PO2 | Demonstrate an ability to developed efficient and algorithmic solutions to problems . | Students demonstrate the can efficiently solve problems. This should be judged by a specific midterm or final exam problem in CSC3610. |

PO1 - Create and evaluate applied solutions to computing problems

Describe what the data tell you about your students’ achievement of this learning outcome. Did the students’ learning improve from pre-test to post-test / did the student demonstrate achievement of a pre-set benchmark? Did students perform equally well on each element or dimension of this learning outcome? Did students improve relative to performance in previous years? What do you attribute improvements and shortfalls to? Ideally, the cause attributed to performance improvements should be strengthened and sustained, while the cause attributed to performance shortfalls should be the target for change.

1. **REFLECTION UPON ACHIEVEMENT OF OUTCOME 1 ACROSS PROGRAM LOCATIONS AND INSTRUCTIONAL MODALITIES –** Did students perform equally well on each element of the University Learning Outcomes, across campus locations (Aurora, Woodstock, GWC) and instructional modality (On-Ground, Online)? If not, what is your assessment of factors contributing to the differences?
2. **REFLECTION ON THE IMPACT OF PRIOR YEAR CHANGES RELATED TO OUTCOME 1** - If any changes were proposed, did they lead to improvement in student learning outcomes? If improvements were demonstrated, how will you ensure the changes you made are sustained? If no gains were demonstrated, reflect upon the reasons why the changes were not successful and propose an alternative strategy or explain why action is no longer necessary.
3. **PROPOSED NEW CURRICULAR/PEDAGOGICAL CHANGES RELATED TO OUTCOME 1:**

* Describe the programmatic changes (curriculum, teaching methods, learning materials, and/or assignments) planned for the coming academic year.
* Specify the date/semester that the changes will be implemented.
* Identify the responsible parties.
* Describe how and when this outcome/element will be reassessed to evaluate the efficacy of the changes.

1. **PROPOSED CHANGES IN ASSESSMENT RELATED TO OUTCOME 1** - (Do you see any changes needed in the learning outcome or in the ways in which achievement of the outcome is measured based on your use of the previous year’s program assessment plan? What types of changes do you plan to make in response to these observations?)

***CONTINUE PROCESS FOR ADDITIONAL LEARNING OUTCOMES***

**III. ASSESSMENT PLAN FOR LEARNING OUTCOMES – UPDATED AS NEEDED**

**UNIVERSITY LEARNING OUTCOMES**

Aurora University assesses 3 University Outcomes - Effective Communication (represented as both Writing and Oral Communication for undergraduate students and represented as Writing for graduate students) and Critical Thinking – using the University’s Undergraduate / Graduate Assessment Rubrics.

1. Identify and describe the assignment(s) utilized to measure Writing. INCLUDE both the lower-level Writing Across the Disciplines / Writing Initiative class and the upper-level class.
2. Identify and describe the assignment(s) utilized to measure Critical Thinking.
3. Identify and describe the assignment(s) utilized to measure Oral Communication.
4. Indicate when / by whom these assignments are collected and rated using the University Assessment Rubrics.
5. If any variations exist across locations or modalities, please specify.

**GENERAL EDUCATION LEARNING OUTCOMES**

1. Identify classes within your program eligible for General Education distribution credit; identify the distribution cluster / learning outcome for each class
2. Identify and describe the assignment(s) utilized to measure each General Education learning outcome for which your program has a class approved.
3. If any variations exist across locations or modalities, please specify.

**PROGRAM LEARNING OUTCOMES**

1. Specify the learning outcomes for your program (state each learning outcome).
2. Explain how each one of these outcomes is aligned with your program’s mission.
3. For each program learning outcome, complete a description or a table that specifies how each learning outcome is assessed. For each learning outcome, include the following information. If any variations in measurement exist across campuses / locations or modalities, please specify.

* The nature of the information gathered to support assessment of the outcome (e.g. written assignment, a speech or presentation, a role play, a performance or product, performance on a competency test, etc.). Indicate if more than one source of information is used.
* From whom the information is gathered (or in what setting, such as a specific class).
* At what time periods the information is gathered (e.g. pre-test and post-test, at the end of each semester, at the end of spring semester, at the end of the academic year in both junior and senior years, etc.).
* By whom the information is gathered and by whom it is assessed. Be certain to capture all program locations and instructional modes.
* How the information is assessed for indicators of achievement of the learning outcome (e.g. a rubric, score on a competency test, an observation checklist, etc.).
* If a rubric, test, checklist, or other instrument/measure is used, attach a copy.
* If there are any instruments you use that assess aspects of your program other than learning outcomes (such as student satisfaction with the program), list those separately and attach.

1. How do you, as a School, Department, or Program collectively evaluate the data gathered using these practices and communicate results?
2. How/when do you make improvements based on your evaluations of the assessments of learning outcomes?
3. How do you archive the data collected, analyses of those data, and a record of review of findings and changes made over the course of multiple years?

NOTE: Assessment data spreadsheets, along with examples of student work artifacts, will be loaded to a Moodle page created by Assessment Directors / Academic Affairs for archiving of assessment-related data.

**III. EXECUTIVE SUMMARY REGARDING CONTINUOUS IMPROVEMENT**

1. **Summary of reflection upon data-based changed to promote improved student learning in the previous year**
2. **Summary of anticipated changes, based on review of data, to promote improved student learning in the coming year**