

**ASSESSMENT DATA ANALYSIS AND UPDATED PLAN**

**FOR**

**Computer Science**

**2020**

**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. 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.

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 now includes content that requires mastery of programming fundamentals.
* 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).

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Program Outcomes**   |  |  |  | | --- | --- | --- | |  | Program Outcome | ABET Outcome | | 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. | | Team-work and communication | PO2: Communicate and collaborate effectively when interacting with other individuals or serving on teams | (d) An ability to function effectively on teams to accomplish a common goal.  (f) An ability to communicate effectively with a range of audiences | | Define, Design, Develop | PO3: Evaluate and develop solutions in an organization by integrating computer science practices of programming and theory. | (b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution  (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs  (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. (k) An ability to apply design and development principles in the construction of software systems of varying complexity | | Professional development | PO4: Understand the importance of, and practice, continuing learning to keep abreast of developments in technology, economics, and society. | (e) An understanding of professional, ethical, legal, security and social issues and responsibilities  h) Recognition of the need for and an ability to engage in continuing professional development  (g) An ability to analyze the local and global impact of computing on individuals, organizations, and society | |

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 seducate students interested in this area. Between 2012-2019, the computer science program has grown. The 2018-19 school year saw 204 enrolled as computer science majors. 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) and CSC4500 (Database) now have content that requires students to learn technologies in demand in the job market. Students further practice these technologies in the project-based capstone course.

More effort is needed to

1. Ensure the core-curriculum continues to produce better outcomes for skills students need to succeed in their career goals.
2. Better align the CSC elective offerings with student career prospects. We need to review the CSC electives and ensure the electives that electives that most help develop students are off
3. Offer better class choice and career direction based on the CSC course offerings. In particular to help students understand the job market expectations based on the skills they learn at AU.
4. Improve the assessment metrics. This plan seeks to improve the quality of the assessment metrics used for CSC. The lack of better measurements is mostly to the leadership volatility in CSC (5 different people led assessment the last 6 years). This last summer, David Lash met with Wataka Kujjmba, and James Petkus met to redefine out assessment metrics and try to improve their quality. This concerted effort resulted in changing almost every assessment metric in both the University and Program Outcomes. For example, in the future, individual writing and oral presentations will be required and assessed using a predefined rubric.

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

**UNIVERSITY LEARNING OUTCOMES**

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

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

As you can see by the following table, the university outcomes are indirectly assessed through the CSC ABET measurements.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **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** | **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** | **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** | **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** | **X** |
| (k) | An ability to apply design and development principles in the construction of software systems of varying complexity | PO#3 | **X** | **X** |

The following shows the results

1. Effective Communication – Program Outcome 2 – Team-work and communication - (f) An ability to communicate effectively with a range of audiences. These results are show good success consistent with past years. It should be cautioned though that these are group presentation results.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| What data sources were used | When were data collected | Indicator | Percent of students earning good or exemplary | 2019-2020 Mean (sd) | 2018-2019 Mean | 2017-2018  Mean |
| CSC4990 capstone project | Spring 2020 | f) communicate effectively  f) Subject knowledge | 100%  80% | 3.5 (0.5)  3.4 (0.65) | 3.22 | 3.18 |

1. Critical Thinking - Program Outcome 3 - (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs. These results are show good results and are consistent with past years. It should be cautioned though that these are group project results.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| What data sources were used | When were data collected | Indicator | Percent of students earning good or exemplary | 2019-2020 Mean (sd) | 2018-2019 Mean | 2017-2018  Mean |
| CSC4990 capstone project | Spring 2020 | c)design and implement  c) dem. comprehension | 42%  45% | 3.23 (1.36)  N/A | 3.11 | 3.23 |

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 Leaning 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?

Computer Science is currently only offered in Aurora.

1. **PROPOSED PROGRAM/CURRICULAR CHANGES RELATED TO UNIVERSITY LEANING 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.

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.
2. Additional writing assignments have been added in CSC2300 and CSC4350 that required a draft and completed paper.
3. New and more specific rubrics have been added to CSC4350 to assess team-work and individual communication abilities.
4. A specific, individual ethics assignment is now required in CSC4350.
5. **REFLECTIONS ON EVIDENCE OF EFFICACY OF PRIOR PROGRAM/CURRICULAR CHANGES**
6. Last year, CSC1700 changed from using Core Java as a programming language to Python. This change, requires students in the next programming course (CSC2650) to learn Java from the start. These courses need to seek stronger outcomes to ready students for the 3rd required course (CSC3610) and better prepare them for core programming skills needed to succeed.
7. Efforts to increase the technology exposure in CSC4500 and CSC4350 are producing students with better skills required by the marketplace. Several students have earned jobs based directly on their mastery level of these technologies.
8. The addition of CSC4100 (Software design) as an elective provides students opportunities to learn and practice core skills needed in the marketplace.

**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 leaning outcome / those leaning outcomes in the coming year.

**PROGRAM OUTCOME 1**

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| --- | --- | --- |
| 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. |

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| --- | --- | --- | --- | --- | --- | --- |
| **What data sources were used** | **When were data collected** | **Indicator** | **Percent of students earning good or exemplary** | **2019-2020 Mean (sd)** | **2018-2019 Mean** | **2017-2018**  **Mean** |
| CSC4990 capstone project | Spring 2020 | A - apply knowledge of computing | 81 | 3.2 (0.92) | 2.89 | 3.04 |
| CSC4500 project | Fall 2019 | I - use current techniques, skills, and tools | 100 | 3.73 (0.45) | n/a | n/a |

1. **Identify STRENGTHS evident in the data.**

Students are meeting all benchmarks in all indicators for this objective.

1. **Identify OPPORTUNITIES for improvement of learning outcomes evident in the data.**

The high variance in scored for indicator (a) should be investigated to determine if students will continue to meet this benchmark

1. **NARRATIVE SUMMARY FOR OUTCOME 1** – While the data looks good against the benchmark, the measure needs to improve. These data are not a good measure of student abilities for PO#1. The data was completed at the group level instead of individuals. This group project makes it difficult to discern the abilities of individual contributors. Instead this outcome should be assessed in 2 other places in the AU CSC curriculum:
   * + 1. ABET Outcome A (apply knowledge of computing )- During a CSC3610 (data structures) assignment or exam, students should be given a problem(s) that require analysis of a problem, selection of an appropriate data structure and implementation of an efficient solution.
       2. ABET Outcome I (use current techniques, skills, and tools) – During CSC2650 (Object Oriented Programming ) or CSC4350 (Software Engineering), students should demonstrate the appropriate knowledge of a modern source code control system (such as Git). The assignment should require students to create a program, place it in Git, create a branch and merge it back into Git.
2. **REFLECTION UPON ACHIEVEMENT OF OUTCOME 1 ACROSS PROGRAM LOCATIONS AND INSTRUCTIONAL MODALITIES –** Did students perform equally well on each element of the University Leaning 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?

Course are only taught at AU Main Campus.

1. **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.

**No changes where proposed** last year.

1. **PROPOSED NEW CURRICULAR/PEDAGOGICAL CHANGES RELATED TO OUTCOME 1:**

**The following changes should be completed next year:**

|  |  |  |  |
| --- | --- | --- | --- |
| **ABET Criteria** | **Course and Semester** | **Parties Responsible** | **Change** |
| A - apply knowledge of computing | CSC4500/F2020 | **Wotaka Kajjumba** | During CSC4500 a database design problem (ERD) will be assigned to each individual that requires them to analyze the problem and build the appropriate tables, triggers, view, and indexes. |
| **I -** use current techniques, skills, and tools | During CSC2650 (Object  Oriented Programming ) , CSC4500 | **Wotaka Kajjumba** | During CSC2650 an exam question will evaluate student proficiency with Git.  During CSC4500 students will demonstrate the skill by individually connect to a database using a framework (e.g., node.js or flask, or ruby on rails). |

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?)

The programming requirements for CSC3610 need to continue emphasize on problem analysis, algorithm design and proper data structure selection. Tools such as Git, need to be purposely and thoroughly introduced into the curriculum.

**PROGRAM OUTCOME 2 -** **Team-work and communication**

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| --- | --- | --- |
| Team-work and communication | PO2: Communicate and collaborate effectively when interacting with other individuals or serving on teams | (d) An ability to function effectively on teams to accomplish a common goal.  (f) An ability to communicate effectively with a range of audiences |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **What data sources were used** | **When were data collected** | **Indicator** | **Percent of students earning good or exemplary** | **2019-2020 Mean (sd)** | **2018-2019 Mean** | **2017-2018**  **Mean** |
| CSC4990 capstone project | Spring 2020 | d) Effective Teams  d) Team Organization | 80%  80% | 3.4 (0.56)  3.4 (0.56) | 2.94 | 3.12 |
| CSC4990 capstone project | Spring 2020 | f) communicate effectively  f) Subject knowledge | 100%  80% | 3.5 (0.5)  3.4 (0.65) | 3.22 | 3.18 |

1. **Identify STRENGTHS evident in the data.**

Students are meeting all benchmarks in all indicators for this objective.

1. **Identify OPPORTUNITIES for improvement of learning outcomes evident in the data.**

Assessment schemes should be reevaluated to assess students on an individual rather than group basis.

1. **NARRATIVE SUMMARY FOR OUTCOME 2** –Outcome 2 was assessed in the proper place of the curriculum. The following refinements are recommended.
   * + 1. ABET Outcome D (teams)– During CSC4990, the measure should be refined to assess the team roles, individual contribution and team cohesion.
       2. ABET Outcome F – During CSC4350 (communicate) a specific writing sample should be collected that requires a draft and completed paper. During CSC4990 presentations should be collected that require individual contribution.
2. **REFLECTION UPON ACHIEVEMENT OF OUTCOME 1 ACROSS PROGRAM LOCATIONS AND INSTRUCTIONAL MODALITIES –** Did students perform equally well on each element of the University Leaning 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?

Course are only taught at AU Main Campus.

1. **REFLECTION ON THE IMPACT OF PRIOR YEAR CHANGES RELATED TO OUTCOME s** - 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.

**No changes where proposed last year.**

1. **PROPOSED NEW CURRICULAR/PEDAGOGICAL CHANGES RELATED TO OUTCOME 1:**

**The following changes should be completed next year:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ABET Criteria** | **Course and Semester** | **Parties Responsible** | **Description** | **How Collected** |
| **D -** effectively on teams | **S2021/CSC4900** | **David Lash** | During CSC4990 the measure should be refined to assess the team roles, individual contribution and team cohesion. | F2021 Rubric |
| **F –** Communicate with wide audience | F2020/CSC4350 | **David Lash** | During CSC4350 a specific writing sample should be collected that requires a draft and completed paper.  During CSC4990 presentation assessments should be collected that require individual contribution | F2021 – A specific rubric TBD that assesses individual presentations. |

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?)

N/A

**PROGRAM OUTCOME 3 -** **Define, Design, Develop**

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| --- | --- | --- |
| Define, Design, Develop | PO3: Evaluate and develop solutions in an organization by integrating computer science practices of programming and theory. | (b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution  (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs  (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. (k) An ability to apply design and development principles in the construction of software systems of varying complexity |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **What data sources were used** | **When were data collected** | **Indicator** | **Percent of students earning good or exemplary** | **2019-2020 Mean (sd)** | **2018-2019 Mean** | **2017-2018**  **Mean** |
| CSC4500 project | Fall 2019 | b) - analyze a problem, and identify and define the computing requirements | 100 | 3.5 (0.51) | 3.22 | 3.14 |
| CSC4990 capstone project | Spring 2020 | c)design and implement  c) dem. comprehension | 42%  45% | 3.23 (1.36)  N/A | 3.11 | 3.23 |
| CSC4500 project | Fall 2019 | g) Global impact | 70 | 3.1 (0.86) | 2.94 | 3.04 |
| CSC4990 capstone project | Spring 2020 | k) | 100 | 3.6 (0.55) | 2.89 | 3.27 |

1. **Identify STRENGTHS evident in the data.**
2. Benchmarks are met for indicators (b) and (k) and are close to being met for indicator (g). The use of test questions for indicator (c) has exposed a weakness in that area.
3. **Identify OPPORTUNITIES for improvement of learning outcomes evident in the data.**

Assessment for indicator (k) should be redesigned to collect data in an individual rather than group basis. Serious time should be put into addressing the weakness in indicator (c).

1. **NARRATIVE SUMMARY FOR OUTCOME 2** –Outcome 3 included ABET G. Instead it should include ABET J since it fits better with PO category
2. **REFLECTION UPON ACHIEVEMENT OF OUTCOME 1 ACROSS PROGRAM LOCATIONS AND INSTRUCTIONAL MODALITIES –** Did students perform equally well on each element of the University Leaning 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?

Course are only taught at AU Main Campus.

1. **REFLECTION ON THE IMPACT OF PRIOR YEAR CHANGES RELATED TO OUTCOME s** - 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.

**No changes where proposed last year.**

1. **PROPOSED NEW CURRICULAR/PEDAGOGICAL CHANGES RELATED TO OUTCOME 1:**

**The following changes should be completed next year:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ABET Criteria** | **Course and Semester** | **Parties Responsible** | **Description** | **How Measured** |
| **B -** analyze a problem, and identify and define the computing requirements | F2020/CSC4350 | David Lash | How Measured: During CSC4350 student will be required to develop a requirements analysis. | Rubric |
| **C -** design, implement, and evaluate a computer-based system | F2020/CSC3610 | David Lash | A Homework during this class can be used to show students can solve a problem of various complexity. | HW CSC3610 |
| **J -** algorithmic principles, and computer science theory in the modeling and design of computer-based systems | F2020/CSC3610 | David Lash | A specific exam question needs to be developed that requires analysis, solution and explanation of design choices | A Standardized CSC3610 Midterm question will be used |
| **K -** apply design and development principles in the construction of software systems of varying complexity | CSC4500 | Wotaka Kajjumba | CSC4500 should develop an assignment that requires the design and analysis of a database and construct it. | Rubric Attached |

1. **PROPOSED CHANGES IN ASSESSMENT RELATED TO OUTCOME 3** - (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?)

N/A

**PROGRAM OUTCOME 4 – Professional Development**

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| --- | --- | --- |
| Professional development | PO4: Understand the importance of, and practice, continuing learning to keep abreast of developments in technology, economics, and society. | (e) An understanding of professional, ethical, legal, security and social issues and responsibilities  h) Recognition of the need for and an ability to engage in continuing professional development  (g) An ability to analyze the local and global impact of computing on individuals, organizations, and society |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **What data sources were used** | **When were data collected** | **Indicator** | **Percent of students earning good or exemplary** | **2019-2020 Mean (sd)** | **2018-2019 Mean** | **2017-2018**  **Mean** |
| CSC4990 capstone project | Spring 2020 | h) | N/A | N/A | 3.17 | 3.23 |
| CSC4990 capstone project | Spring 2020 | e) - professional, ethical, legal, security and social issues | 80 | 3.65 (1.17) | 3.00 | 3.18 |
| CSC4500 project | Fall 2019 | j) | 100 | 3.73 (0.45) | 3.11 | 3.04 |

1. **Identify STRENGTHS evident in the data.**

All benchmarks have been met to indicators (e) and (j).

1. **Identify OPPORTUNITIES for improvement of learning outcomes evident in the data.**

Data was not collected for indicator (h). Assessment of this indicator should be built into the standard for this course

1. **NARRATIVE SUMMARY FOR OUTCOME 2** –ABET G should be included here. ABET J should move to PO #3 since it fits better with that PO category
2. **REFLECTION UPON ACHIEVEMENT OF OUTCOME 1 ACROSS PROGRAM LOCATIONS AND INSTRUCTIONAL MODALITIES –** Did students perform equally well on each element of the University Leaning 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?

Course are only taught at AU Main Campus.

1. **REFLECTION ON THE IMPACT OF PRIOR YEAR CHANGES RELATED TO OUTCOME s**- 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.

**No changes where proposed last year.**

1. **PROPOSED NEW CURRICULAR/PEDAGOGICAL CHANGES RELATED TO OUTCOME 1:**

**The following changes should be completed next year:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **ABET Criteria** | **Course and Semester** | **Parties Responsible** | **Description** | **How Measured** |
| E - professional, ethical, legal, security and social issues | F2020/CSC4350 | David Lash | During CSC4350 students will be required to answer a prompt about ethical dilemma. This paper will include a draft and final paper. | Rubric attached |
| H - continuing professional development | S2021/CSC4990 | David Lash | A prompt needs to be developed during CSC4990 that enables students to reflect and comment | TBD – Dec 2020 for collection S2021 |
| G - the local and global impact of computing | F2020/CSC4350 | David Lash | The prompt during the ethical dilemma should include an analyze of the impact on society. | Rubric attached |

1. **PROPOSED CHANGES IN ASSESSMENT RELATED TO OUTCOME 3** - (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?)

N/A

**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. Provide a detailed description of the assignment(s) utilized to measure Effective Communication.

Effective communication will be assessed in multiple places in the CSC curriculum:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course** | **When** | **Who** | **Description** | **How Collected** |
| CSC2300 | F2020/CSC2300 | James Petkus | Student will respond to a prompt that requires analysis of the tradeoffs of a specific architectural component. | Rubric TBD |
| CSC4350 | F2020/CSC4350 | David Lash | Students will analyze an ethical dilemma caused by a real-life failure in Software Engineering ethics. | Rubric – Attached |

1. Provide a detailed description of the assignment(s) utilized to measure Critical Thinking.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course** | When | **Who** | **Description** | **How Collected** |
| CSC3610 | F2020/CSC3610 | David Lash | Develop a computing problem to solved a specific problem and evaluate its complexity and algorithmic design choices. | A Standardized CSC3610 Midterm question will be used (see attachment) |

During a CSC3610 exam, students will be asked to analyze an assess and solve a problem that may have several different potential solutions.

1. Provide a detailed description of the assignment(s) utilized to measure Oral Communication (undergraduate students only).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course** | When | **Who** | **Description** | **How Collected** |
| CSC4990 | S2021/CSC4990 | David Lash | Students will be asked to give oral presentations that describe their project status | A rubric will be use (see attachment) |

1. Indicate when / by whom these assignments are collected and rated using the University Assessment Rubrics.

**PROGRAM LEARNING OUTCOMES**

1. Specify the learning outcomes for your program (state each leaning outcome).
2. **Program Outcomes**

|  |  |  |
| --- | --- | --- |
|  | Program Outcome | ABET Outcome |
| 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. |
| Team-work and communication | PO2: Communicate and collaborate effectively when interacting with other individuals or serving on teams | (d) An ability to function effectively on teams to accomplish a common goal.  (f) An ability to communicate effectively with a range of audiences |
| Define, Design, Develop | PO3: Evaluate and develop solutions in an organization by integrating computer science practices of programming and theory. | (b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution  (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs  (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. (k) An ability to apply design and development principles in the construction of software systems of varying complexity |
| Professional development | PO4: Understand the importance of, and practice, continuing learning to keep abreast of developments in technology, economics, and society. | (e) An understanding of professional, ethical, legal, security and social issues and responsibilities  h) Recognition of the need for and an ability to engage in continuing professional development  (g) An ability to analyze the local and global impact of computing on individuals, organizations, and society |

1. Explain how each one of these outcomes is aligned with your program’s mission.

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 the defining processes of 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.

|  |  |  |
| --- | --- | --- |
|  | Program Outcome | Mission Alignment |
| 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 | Outcome focus on helping students design and implement problems within their discipline and build their critical thinking abilities. |
| Team-work and communication | PO2: Communicate and collaborate effectively when interacting with other individuals or serving on teams | Outcome focuses on helping students effectively communicate and work on teams. |
| Define, Design, Develop | PO3: Evaluate and develop solutions in an organization by integrating computer science practices of programming and theory. | Outcome focuses on helping student solve problems appropriate to their discipline. |
| Professional development | PO4: Understand the importance of, and practice, continuing learning to keep abreast of developments in technology, economics, and society. | Outcome focus on helping student be a understand the impact their discipline has on society and their responsibilities as a professional. |

1. 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:

* 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.

(see tables in **PROGRAM LEARNING OUTCOMES above.)**

1. How do you, as a School, Department, or Program collectively evaluate the data gathered using these practices and communicate results?

After the spring semester we will gather data, prepare results and review.

1. How/when do you make improvements based on your evaluations of the assessments of learning outcomes?

As we analyze the data and we will make recommendations and improvements during the spring analysis session.

1. 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?

Data will be kept on a departmental drive.

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 Reflections on Prior Changes**

The following lists the recent changes in the CSC program and reflections.

|  |  |
| --- | --- |
| **Change** | **Reflection** |
| CSC1700 switched from Java to Python as a base language | A specific measure should be developed for students entering and completing CSC2650 to assess its efficacy. |

1. **Summary of Anticipated Changes**

The following summarize some anticipated changes to the program

|  |  |
| --- | --- |
| **Change** | **Reflection** |
| While a number of the POs, seek to measure student abilities, they can be accomplished without specifically helping students succeed in their career aspirations. We should add a 5 PO that targets students preparedness for post graduation goals.  PO #5 – Students are prepared for their next step in their CSC career and demonstrate competency in programming concepts and abilities needed for CS graduates to succeed in their career goals. | Traditionally the CSC capstone has been a group-based project with little or no other requirements. During capstone we should specifically require student to demonstrate understanding of key CSC concepts and problem solving abilities. Later after graduation, we should measure how long it takes them to find work (or get accepted to a post-graduate program) and ask them to reflect on how well the AU program helped them succeed. Specific measures for PO #5 that can be gathered during capstone include:   1. Demonstration of understand key OOP principles such as inheritance, Polymorphism, Encapsulation, abstraction with interfaces. 2. Mastery of at least 1 programming language 3. Mastery of problems that require mastery of    1. arrays    2. 2-dimensional arrays    3. Hash Maps    4. Objects    5. String manipulation    6. Working with a database    7. SQL |

1. **Per Course Recommendations Assessment Needs**

|  |  |  |
| --- | --- | --- |
| **Course** | **Criterion** | **Assessment** |
| **CSC2300** | **Standard 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** | **How Measured: CSC2300 develop a writing assignment that compares architecture of different systems or components and analyzes trade-offs. (Writing Sample 1).** |
| **CSC3610** | **Standard a)** **An ability to apply knowledge of computing and mathematics appropriate to the discipline** | **How Measured: During CSC3610 - Demonstrate ability to solve problems of varying difficulties. Must be able to select and use the appropriate data structure or analyze complexity of an algorithm.** |
|  | **Standard c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs** | **How Measured: During CSC3610 – Develop a computing problem to solved a specific problem and evaluate its complexity and algorithmic design choices.** |
| **CSC4350** | **Standard e) An understanding of professional, ethical, legal, security and social issues and responsibilities** | **How Measured: During CSC4350 students will be required to answer a prompt about ethical dilemma.** |
| **CSC2650** | **Standard i) An ability to use current techniques, skills, and tools necessary for computing practice.** | **How Measured: How to use Git to create a portfolio and put your personal code under Git and proper use and an IDE.**  **Assignment: Create a program and put in Git. Graded on completion of the problem AND in Git.** |
| **CSC4500** | **Standard k) An ability to apply design and development principles in the construction of software systems of varying complexity** | **How Measured: CSC4500 should develop an assignment that requires the design and analysis of a database and construct it.** |
| **CSC4990** | **Standard d)** **An ability to function effectively on teams to accomplish a common goal** | **Team’s should be assessed in terms of individual contribution and team cohesion.** |
|  | **Standard f) An ability to communicate effectively with a range of audiences** | **How Measured: collect a writing sample or 2 and require individual presentation. We can reviews individual contributions to a group presentations.** |
|  |  |  |
|  |  |  |
|  |  |  |