Institutional Effectiveness
2024-2025

Program: Computer Science BS
College and Department: College of Engineering, Computer Science
Contact: Gerald Gannod

Mission:
"Our mission is to be widely recognized for enabling students to have global impact through innovative and quality programs, through research that emphasizes collaborative partnerships, and by enabling the success of a diverse student, faculty, and alumni community."

This mission is consistent with the University's mission to "provide leadership and outstanding programs in engineering, the sciences, and related areas that benefit the people of Tennessee and the nation" and with the University's commitment to the life-long success of students and to enrich the lives of people and communities in the Upper Cumberland region of Tennessee. It is also consistent with Tech Tomorrow, the University's strategic plan, and it's focus on improving student experience, transforming technology, and creating distinctive programs.

Attach Curriculum Map (Educational Programs Only):
See Appendix 1

SLO 1 Analyze a complex computing problem

Define Outcome:
Students can analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.

This outcome is as defined by the Accreditation Board for Engineering and Technology (ABET) Computer Science Accreditation Commission (CAC).

Assessment Methods:
Direct Assessment. Several courses are assessed every semester. These assessments directly examine student work based on traits (performance criteria) created specifically for each student outcome. The measurement rubric used for direct assessment uses a four-level rubric: Excelling, Practicing, Apprentice, and Novice (E/P/A/N). These criteria are performed on a per student basis. An example is provided below.
Performance Criteria (Traits):

- Students can identify and define the computing requirements appropriate to its solution. (Bloom's taxonomy level: Analysis)

- Students can analyze and weigh trade-offs related to computing problems. (Bloom's taxonomy level: Analysis).

Faculty Course Reflections (all courses): Each faculty member is asked to complete a course reflection at the end of each semester. The reflection allows a faculty member to summarize the results of the course, map the appropriate objectives and outcomes to the course and identify successes from the semesters, opportunities for improvement, puzzles (i.e., questions to be resolved), suggested changes, issues with facilities, technology issues, and other reflections.

Pre-Post Surveys (Pre-Post): Pre-post surveys are conducted for courses in which a direct assessment is scheduled. The pre-post survey is administered twice: once at the beginning of a semester and again at the end of a semester.

Criteria for Success (Thresholds for Assessment Methods):

Direct Assessment

- *Summative Assessment:* 70% of students in Excelling or Practicing. Summative assessments capture the "end-game" so to speak and so we use this measure to kick-off identification of action items.
- *Formative Assessment:* 70% of students in Excelling, Practicing, or Apprentice. Formative assessments provide us with "mid-term" knowledge of attainment and provide a comparative measure by which to identify whether students are making progress in the program.

Indirect Assessment

Pre-Post Surveys (Pre-Post): Pre-post surveys are conducted for courses in which a direct assessment is scheduled. The pre-post survey is administered twice: once at the beginning of a semester and again at the end of a semester. The results of the pre-post survey is measured using a Student's T-Test to determine whether a statistically significant change in a student's perception of learning is observed. Any measurement of the T-Test that results in a p-value of 0.05 or lower is deemed as significant.

In regards to attainment levels, we expect the following: Student perceptions should exhibit a change in the aggregate mean towards "Extremely Well". Achieving a p-value of 0.05 is desirable but secondary.

Link to 'Tech Tomorrow' Strategic Plan:

2.A Technology Infused Programs

Results and Analysis:

Reanalyzing the direct assessments for ABET Outcome 1 ("Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions")

with the programmatic threshold of 70% of students performing at the Excelling or Practicing levels, we find the following:

CSC 1300 – Introduction to Problem Solving & Computer Programming (Fall 2024)
All three performance traits met or exceeded the 70% threshold:

- Trait 1 – Identifying and defining computing requirements: 89.8% of students (Excelling + Practicing) met the standard.
- Trait 2 – Diagnosing and fixing errors in solutions: 85.1% met the threshold.
- Trait 3 – Analyzing and weighing trade-offs: 92.2% met the standard.

Conclusion: CSC 1300 clearly meets Outcome 1 expectations. Students are demonstrating proficiency in foundational analytical and problem-solving skills. No immediate revisions needed.

CSC 4610 – Software Engineering I (Fall 2024)
Mixed results relative to the 70% threshold:

- Trait 1 – Identifying computing requirements:
  - Midterm Q1 (Stakeholder Analysis): 88% (✓ Meets)
  - Midterm Q2a-d (User Story Critique): 23% (✗ Fails – 65% Novice)
  - Project Charter Documents: 81% (✓ Meets)
- Trait 2 – Analyzing trade-offs:
  - Midterm Q3a-d (Effort Estimation / MVP Analysis): 65% (✗ Fails – right below threshold)
  - Midterm Q4 (Business Rule Variations): 79% (✓ Meets)

Conclusion: Outcome 1 is partially met in CSC 4610. While students can identify computing requirements in structured formats (e.g., stakeholder analysis and charter writing), they struggle with open-ended user story critique and effort estimation. Improvements should target enhanced instruction and practice in requirement synthesis and trade-off evaluation.

CSC 4615 – Software Engineering II (Spring 2025)
Strong performance on Outcome 1:

- Project Charter (Requirement Identification and Analysis): 81% of students performed at Excelling or Practicing (✓ Meets)
- Ongoing assessment via project work and iteration reviews further confirmed students' ability

to analyze computing problems and develop sound solutions.

Conclusion: CSC 4615 meets the threshold for Outcome 1. Students apply analytical skills effectively in authentic project environments, suggesting that the improvements needed in CSC 4610 are paying off by the time students reach CSC 4615.

Overall Summary for Outcome 1

Course	Outcome 1 Met?	Notes
CSC 1300	✅ Yes	All traits well above 70%
CSC 4610	⚠️ Partial	User story critique and effort trade-offs need attention
CSC 4615	✅ Yes	Strong application of analysis and requirement skills

Recommendations

- Reinforce user story critique and requirement writing in CSC 4610, possibly through structured workshops or peer-reviewed exercises.
- Clarify effort estimation and trade-off analysis using more visual and scenario-based assignments.
- Maintain and build on CSC 1300 and CSC 4615 practices, as they clearly support student development on Outcome 1.

Indirect Assessment

The reflections for **CSC 4610, 4615, and 4620 (Software Engineering I & II, and Senior Design)** across Fall 2024 and Spring 2025 highlight consistent strengths in experiential learning, while also pointing to ongoing challenges in student engagement, team dynamics, and instructional logistics.

Across all instructors, **real-world, team-based projects** remain central to the success of these courses. Students generally performed well, with a strong majority earning A's and B's. Projects emphasizing **agile practices**, **industry tools like GitHub and Teams**, and **customer interaction** were effective in preparing students for professional environments. Agile structures, including **daily standups**, **sprint-based development**, and **mentorship models**, helped foster collaboration and accountability. Several instructors also noted improved usability and user experience outcomes after incorporating resources like *The Design of Everyday Things* into the curriculum.

Use of Results to Improve Outcomes:

The analysis of Outcome 1 focused on students' ability to analyze complex computing problems and apply relevant computing principles. The analysis reveals that CSC 1300 and CSC 4615 met the programmatic threshold of 70% of students performing at the excelling or practicing level across all assessment criteria, demonstrating strong foundational and applied problem-solving skills. CSC 4610, however, only partially met the outcome: while students performed well in structured tasks such as stakeholder analysis and project documentation, they struggled with more open-ended assignments like critiquing and writing user stories or estimating effort, where 65% of students fell into the novice category on one of the exam questions used for assessment. These findings suggest that while students gain competency in foundational analysis and practical implementation, they require additional support in tasks requiring synthesis, judgment, and the evaluation of ambiguous or real-world scenarios. Strengthening instruction in user story development and effort trade-off analysis in CSC 4610 will be critical to ensuring consistent achievement of this outcome across the curriculum.

SLO 2. Design, implement, and evaluate a computing-based solution

Define Outcome:

Students can design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

This outcome is as defined by the Accreditation Board for Engineering and Technology (ABET) Computer Science Accreditation Commission (CAC).

Assessment Methods:

***Direct Assessment*.** Several courses are assessed every semester. These assessments directly examine student work based on traits (performance criteria) created specifically for each student outcome. The measurement rubric used for direct assessment uses a four-level rubric: Excelling, Practicing, Apprentice, and Novice (E/P/A/N). These criteria are performed on a per student basis. An example is provided below.

*Performance Criteria (Traits)***:**

- The student can design a computing-based solution given a set of requirements
- The student can implement a computing-based solution given a set of requirements
- The student can evaluate/test a computing-based solution given a set of requirements

We assessed these criteria using a significant design and implementation project. The assignment description is attached.

Faculty Course Reflections (all courses): Each faculty member is asked to complete a course reflection at the end of each semester. The reflection allows a faculty member to summarize the results of the course, map the appropriate objectives and outcomes to the course and identify successes from the semesters, opportunities for improvement, puzzles (i.e., questions to be resolved), suggested changes, issues with facilities, technology issues, and other reflections.

Pre-Post Surveys (Pre-Post): Pre-post surveys are conducted for courses in which a direct assessment is scheduled. The pre-post survey is administered twice: once at the beginning of a semester and again at the end of a semester.

Criteria for Success (Thresholds for Assessment Methods):

Direct Assessment

- *Summative Assessment:* 70% of students in Excelling or Practicing. Summative assessments capture the "end-game" so to speak and so we use this measure to kick-off identification of action items.
- *Formative Assessment:* 70% of students in Excelling, Practicing, or Apprentice. Formative assessments provide us with "mid-term" knowledge of attainment and provide a comparative measure by which to identify whether students are making progress in the program.

Indirect Assessment

Pre-Post Surveys (Pre-Post): Pre-post surveys are conducted for courses in which a direct assessment is scheduled. The pre-post survey is administered twice: once at the beginning of a semester and again at the end of a semester. The results of the pre-post survey is measured using a Student's T-Test to determine whether a statistically significant change in a student's perception of learning is observed. Any measurement of the T-Test that results in a p-value of 0.05 or lower is deemed as significant.

In regards to attainment levels, we expect the following: Student perceptions should exhibit a change in the aggregate mean towards "Extremely Well". Achieving a p-value of 0.05 is desirable but secondary.

Link to 'Tech Tomorrow' Strategic Plan:

2.A Technology Infused Programs

Results and Analysis:

Outcome 2: Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

Program Threshold: At least 70% of students should score at the Excelling or Practicing level.

CSC 2310 – Object-Oriented Programming and Design (Fall 2024)
Designing Solutions:
84% of students (72% excelling, 12% practicing) met or exceeded the threshold.

Implementing Solutions:
88% of students excelled; no students performed at the practicing level.

✅ Threshold Met for both design and implementation.

Observations: Students performed exceptionally well in hands-on implementation, but struggled more with abstract design elements. Instructors noted a reluctance to engage with modeling tools such as use case and class diagrams.

Recommendations: Include more opportunities for students to practice exercising discretion and judgment in open-ended design tasks, as opposed to step-by-step code-following.

CSC 3300 – Database Management Systems (Fall 2024)
Trait 1: Designing Solutions:
- Majority of test items showed strong results with most scores above the 70% threshold.
- One item (Test 4 – Q2) had only 50% excelling and 0% practicing – below threshold.
- Overall: Most items met the threshold, but isolated gaps suggest inconsistency in mastering design skills.

Trait 2: Implementing Solutions:
- Most assessments demonstrated high performance (e.g., 78.4% excelling in Test 1 – Q25, 81% in Test 2 – Q12).
- One notable exception: Test 3 – Q9 had only 29.7% excelling and no practicing – fails threshold.
- Overall: Generally strong performance, with one weak spot in Java-SQL integration.

Trait 3: Evaluating Solutions:
- Most items exceeded the 70% threshold (e.g., 100% excelling on Test 3 – Q6, 86.5% on Test 1 – Q15).
- Some questions (e.g., Test 2 – Q11) showed lower results (only 54% excelling + practicing), but these were outliers.

✅ Threshold Met overall, with minor exceptions.

Observations: Students demonstrate growing confidence and capability in design,

implementation, and evaluation as the semester progresses. Performance in early evaluation tasks was weaker, indicating the need for more scaffolding early in the course.

Recommendations: Increase early-semester practice in query and schema evaluation to prepare students for complex tasks later in the course.

Overall Summary

Course	Design Met?	Implement Met?	Evaluate Met?	Outcome 2 Met?
CSC 2310	✅ Yes	✅ Yes	N/A	✅ Yes
CSC 3300	⚠️ Mostly	✅ Yes	✅ Yes	✅ Yes (with notes)

Indirect assessment

The course reflections for CSC 2310 and CSC 3300 from Fall 2024 and Spring 2025 reveal several key themes regarding instructional successes, areas for improvement, and evolving student needs.

For CSC 2310 (Object-Oriented Programming and Design), instructors Stewart and Strickler both noted strong student engagement, particularly through active learning methods such as collaborative coding and hands-on diagramming activities. Students responded well to lectures that incorporated step-by-step examples and lab sessions aligned with instructional content. However, common challenges emerged around time management, insufficient practice with debugging and Git, and difficulty mastering topics like exceptions and error handling. Both instructors questioned the course's title, suggesting it fails to fully communicate the emphasis on software development practices, user stories, and agile methodologies. Recommendations included improving course planning, minimizing overlap with other courses (e.g., version control), and enhancing clarity of expectations from the outset.

For CSC 3300 (Database Management Systems), instructors Burchfield and Kubiak emphasized the benefits of integrating hands-on practice with theory. Students were especially engaged when they had some control over project direction and when practical application—such as designing basic user interfaces—was incorporated. Still, instructors observed that large, monolithic final projects led to student procrastination and stress, and technical challenges like SQL syntax mastery and network limitations hampered some learning experiences. Both instructors advocated for changes such as adopting agile sprints to scaffold larger assignments, incorporating SQL certification preparation, and exploring alternate technologies for class

organization and assessment. While engagement with NoSQL databases was unexpectedly strong, the reasoning behind student preferences in this area remained unclear.

In summary, the reflections suggest that while the courses are largely effective and well-received, improvements in project pacing, topic clarity, technological integration, and course titling could significantly enhance student experience and learning outcomes.

Final Notes

- Both courses support Outcome 2, though CSC 3300 had isolated weaknesses on specific test items.
- Across both courses, implementation skills are stronger than design or evaluation, especially in early-semester tasks.
- Future offerings should focus on improving abstract design engagement in CSC 2310 and bolstering evaluation skills earlier in CSC 3300.

Use of Results to Improve Outcomes:

The analysis of Outcome 2 centered on students' ability to design, implement, and evaluate computing-based solutions. The analysis shows that both CSC 2310 and CSC 3300 met the program's 70% threshold for student performance at the excelling or practicing level. In CSC 2310, students demonstrated particularly strong implementation skills, with 88% excelling, though engagement with design tasks like use case and class diagrams was lower, suggesting discomfort with abstract modeling. CSC 3300 also showed strong results in implementation and evaluation, with most assessment items exceeding the threshold, though a few isolated test questions—particularly in early design and Java integration—fell short. These findings indicate that while students are developing solid technical skills, greater emphasis is needed on early-semester design practice in CSC 3300 and on fostering design thinking and discretionary decision-making in CSC 2310 to ensure balanced competency across all areas of Outcome 2.

SLO 3 Communicate effectively in a variety of professional contexts.

Define Outcome:

Students can communicate effectively in a variety of professional contexts.

This outcome is as defined by the Accreditation Board for Engineering and Technology (ABET) Computer Science Accreditation Commission (CAC).

Assessment Methods:

Direct Assessment. Several courses are assessed every semester. These assessments directly examine student work based on traits (performance criteria) created specifically for each student outcome. The measurement rubric used for direct assessment uses a four-level rubric: Excelling, Practicing, Apprentice, and Novice (E/P/A/N). These criteria are performed on a per student basis. An example is provided below.

Performance Criteria (Traits):

- Students can communicate project status. (Bloom's taxonomy level: Synthesis)
- Students can describe an overview of a project. (Bloom's taxonomy level: Comprehension)

Faculty Course Reflections (all courses): Each faculty member is asked to complete a course reflection at the end of each semester. The reflection allows a faculty member to summarize the results of the course, map the appropriate objectives and outcomes to the course and identify successes from the semesters, opportunities for improvement, puzzles (i.e., questions to be resolved), suggested changes, issues with facilities, technology issues, and other reflections.

Pre-Post Surveys (Pre-Post): Pre-post surveys are conducted for courses in which a direct assessment is scheduled. The pre-post survey is administered twice: once at the beginning of a semester and again at the end of a semester.

Criteria for Success (Thresholds for Assessment Methods):

Direct Assessment

- *Summative Assessment:* 70% of students in Excelling or Practicing. Summative assessments capture the "end-game" so to speak and so we use this measure to kick-off identification of action items.
- *Formative Assessment:* 70% of students in Excelling, Practicing, or Apprentice. Formative assessments provide us with "mid-term" knowledge of attainment and provide a comparative measure by which to identify whether students are making progress in the program.

Indirect Assessment

Pre-Post Surveys (Pre-Post): Pre-post surveys are conducted for courses in which a direct assessment is scheduled. The pre-post survey is administered twice: once at the beginning of a semester and again at the end of a semester. The results of the pre-post survey is measured using a Student's T-Test to determine whether a statistically significant change in a student's perception of learning is observed. Any measurement of the T-Test that results in a p-value of 0.05 or lower is deemed as significant.

In regards to attainment levels, we expect the following: Student perceptions should exhibit a change in the aggregate mean towards “Extremely Well”. Achieving a p-value of 0.05 is desirable but secondary.

Link to 'Tech Tomorrow' Strategic Plan:
1.D High Impact Practices

Results and Analysis:

Outcome 3: Communicate effectively in a variety of professional contexts.
Program Threshold: At least 70% of students should perform at the Excelling or Practicing levels.

Trait 1: Develop and Present Domain Knowledge in Computer Science
Assessed through:
- Group Tutorial Video
- Draft Tutorial Advertisement Flyer
- Final Tutorial Advertisement Flyer

Results:
- Tutorial Video: 100% met threshold (73.7% excelling, 26.3% practicing)
- Draft Flyer: 100% met threshold (65.8% excelling, 34.2% practicing)
- Final Flyer: 100% met threshold (73.7% excelling, 26.3% practicing)

Overall: All 114 assignment instances scored at Excelling or Practicing — 100% met the threshold. Students demonstrated strong skills in researching, packaging, and presenting technical content for diverse audiences.

Trait 2: Organize and Write Procedural Directions
Assessed through:
- Group Tutorial Project Documentation

Results:
- 78.9% met the threshold (52.6% excelling, 26.3% practicing)
- 21.1% fell below threshold (13.2% apprentice, 7.9% novice)

Conclusion: This trait narrowly meets the 70% threshold, but indicates a noticeable drop in performance compared to Trait 1. Students struggled more with structuring and articulating

detailed technical steps in written form, particularly when expected to produce professional-grade documentation without close templates or examples.

Trait 3: Communicate Effectively in Oral and Written Forms

Assessed through:
- Group Project Proposal Memo
- Mock Interview Assignment
- Industry Professional Ethics Interview

Results:
- Group Memo: 81.6% met threshold (63.2% excelling, 18.4% practicing)
- Mock Interview: 89.5% met threshold (71.1% excelling, 18.4% practicing)
- Industry Interview: 92.1% met threshold (76.3% excelling, 15.8% practicing)

Overall: Across all three assessments, 87.7% of students met the threshold, with very few in novice or apprentice categories. Students demonstrated consistent professionalism in both written and oral formats, and the assignments reflect success in preparing students for real-world communications such as job interviews and professional correspondence.

Outcome 3 was successfully met across all three traits. Trait 1 showed particularly strong mastery, suggesting students are confident in delivering technical content to peer and public audiences. Trait 3 also reflects solid preparation for professional communications, an essential career readiness skill. The only area of concern was Trait 2, where nearly a quarter of students failed to meet expectations. This gap likely stems from discomfort or inexperience with producing detailed, self-contained procedural documentation.

Indirect assessment

To improve CSC 3040, the course should be restructured to focus more clearly on professionalism and ethics by revising its title to reflect these core themes and removing the misleading emphasis on research, which occupies only a small portion of the curriculum. Ethics could be more effectively taught as a standalone 1-credit course, allowing the main class to concentrate on practical skills and real-world preparation. Career readiness components should be enhanced by incorporating a CS-specific resume template developed with industry input and by reintegrating the university's Purple Career Readiness Program to streamline student experience. Classroom spaces should better support group collaboration, and research elements could be more meaningfully embedded within existing group projects to align with student interest without overburdening the course.

Recommendations:
- Increase scaffolding for technical writing assignments (e.g., provide annotated examples or peer review).
- Emphasize the importance of documentation in professional contexts to boost student motivation and buy-in.
- Continue leveraging real-world simulations (like the mock interview) to enhance engagement with professional communication skills.

Use of Results to Improve Outcomes:

The assessment of Outcome 3 in CSC 3040 demonstrates that students largely achieved the program's communication goals, with over 70% of students meeting or exceeding expectations across all three traits. Students excelled at developing and presenting domain-specific material (100% met threshold) and showed strong performance in professional written and oral communication (87.7% met threshold). However, while still meeting the standard, students were less proficient in procedural technical writing, with only 78.9% achieving the desired level—indicating the need for more instructional support in documentation practices. Overall, Outcome 3 was successfully met, but targeted enhancements in procedural writing could further strengthen performance.

SLO 4. Recognize professional responsibilities and make informed judgments

Define Outcome:

Students can recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

This outcome is as defined by the Accreditation Board for Engineering and Technology (ABET) Computer Science Accreditation Commission (CAC).

Assessment Methods:

Direct Assessment. Several courses are assessed every semester. These assessments directly examine student work based on traits (performance criteria) created specifically for each student outcome. The measurement rubric used for direct assessment uses a four-level rubric: Excelling, Practicing, Apprentice, and Novice (E/P/A/N). These criteria are performed on a per student basis. An example is provided below.

Performance Criteria (Traits):

- Students can recognize responsibilities as a computing professional. (Bloom's taxonomy level: Knowledge)
- Students can recognize, identify, and describe ethical concepts related to computing. (Bloom's taxonomy level: Comprehension)
- Students can recognize, identify, and describe legal concepts related to computing. (Bloom's taxonomy level: Comprehension)
- Students can analyze the challenges associated with ethical concepts in the context of computing. (Bloom's taxonomy level: Analysis)
- Students can analyze the challenges associated with legal concepts in the context of computing. (Bloom's taxonomy level: Analysis)
- Students can apply ethical concepts to assess computing practice. (Bloom's taxonomy level: Application)
- Students can apply legal concepts to assess computing practice. (Bloom's taxonomy level: Application)

Faculty Course Reflections (all courses): Each faculty member is asked to complete a course reflection at the end of each semester. The reflection allows a faculty member to summarize the results of the course, map the appropriate objectives and outcomes to the course and identify successes from the semesters, opportunities for improvement, puzzles (i.e., questions to be resolved), suggested changes, issues with facilities, technology issues, and other reflections.

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Direct Assessment

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Indirect Assessment

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using a Student's T-Test to determine whether a statistically significant change in a student's perception of learning is observed. Any measurement of the T-Test that results in a p-value of 0.05 or lower is deemed as significant.

In regards to attainment levels, we expect the following: Student perceptions should exhibit a change in the aggregate mean towards "Extremely Well". Achieving a p-value of 0.05 is desirable but secondary.

Link to 'Tech Tomorrow' Strategic Plan:

2.A Technology Infused Programs

Results and Analysis:

Outcome 4: Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

Program Threshold: At least 70% of students should score at Excelling or Practicing levels.

CSC 3040 – Professionalism, Communication, and Research

Trait	Description	Excelling + Practicing	Threshold Met?
Trait 1	Recognize professional responsibilities	58.6%	❌ No
Trait 2	Recognize, describe ethical concepts	96.2%	✅ Yes
Trait 3	Recognize, describe legal concepts	60.0%	❌ No
Trait 4	Analyze ethical challenges	82.9%	✅ Yes
Trait 5	Analyze legal challenges	87.1%	✅ Yes
Trait 6	Apply ethical principles	81.4%	✅ Yes
Trait 7	Apply legal principles	65.7%	❌ No

Conclusion: Only 4 out of 7 traits met the threshold. While students demonstrated strong understanding and application of ethical principles, their grasp of legal concepts and broader professional obligations was weaker. The outcome is therefore partially met.

CSC 2570 – Introduction to Cybersecurity and Privacy

Trait	Description	Excelling + Practicing	Threshold Met?
Trait 1	Recognize, identify, describe legal and ethical challenges	98%	✅ Yes

Conclusion: Students in CSC 2570 performed strongly, especially in early exposure to applied ethics. Outcome 4 is met in this course.

CSC 3570 – IT Security

Trait	Description	Excelling + Practicing	Threshold Met?
Trait 1	Recognize, identify, describe legal and ethical challenges	99%	✅ Yes

Conclusion: Reinforcement of legal frameworks like GDPR and HIPAA proved effective. Outcome 4 is clearly met in CSC 3570.

Overall Summary

Course	Outcome 4 Met?	Notes
CSC 3040	❌ Partially	Deficiencies in legal concept application and professional obligations
CSC 2570	✅ Yes	Strong early performance on ethics/legal awareness
CSC 3570	✅ Yes	Continued proficiency in legal/ethical recognition

Indirect assessment

The reflections for CSC 2570 – *Introduction to Cybersecurity & Privacy* from Fall 2024 and Spring 2025 highlight several positive outcomes, including increased student engagement with core topics such as cybersecurity threats and attacks. The use of interactive tools like Kahoot! and newly developed course materials helped improve classroom participation and content clarity.

Student presentations, particularly in the Fall, showed marked improvement in both quality and breadth of topics. The course was generally well-paced, and continued development of materials helped close instructional gaps, contributing to a more structured and engaging learning environment.

Despite these strengths, challenges remain. Students consistently struggled with the Cyber Community Involvement requirement due to inconsistent leadership and visibility within student-led organizations like CyberEagles and CIGs. Additionally, course disruptions in Spring reduced time for project presentations. The instructor also raised concerns about the lack of hands-on technical work, which limits the course's effectiveness for CS majors, and questioned the relevance of covering numerous outdated policy models. Suggested improvements include incorporating simple, accessible technical assignments, streamlining theoretical content to focus on practical application, and improving coordination with cyber-related student groups to enhance engagement and relevance for all students.

Use of Results to Improve Outcomes:

The assessment of ABET Outcome 4 across CSC 3040, 2570, and 3570 reveals mixed results. While students in CSC 2570 and CSC 3570 consistently exceeded the 70% threshold across all traits—demonstrating strong comprehension of ethical and legal frameworks—CSC 3040 students struggled with applying legal concepts (65.7%), recognizing professional responsibilities (58.6%), and articulating legal knowledge (60%). Although CSC 3040 students performed well in ethical analysis and application, the outcome is only partially met due to significant gaps in legal understanding and professional judgment. These findings suggest a need for scaffolded development of legal reasoning and professional responsibility throughout the curriculum.

SLO 5. Function effectively as a member or leader of a team

Define Outcome:

Students can function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

This outcome is as defined by the Accreditation Board for Engineering and Technology (ABET) Computer Science Accreditation Commission (CAC).

Assessment Methods:

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*Performance Criteria (Traits)**:***

- Students can create and manage a plan. (Bloom's taxonomy level: Synthesis)
- Students can track and manage a plan. (Bloom's taxonomy level: Synthesis)
- Students can produce deliverables. (Bloom's taxonomy level: Application)

Faculty Course Reflections (all courses): Each faculty member is asked to complete a course reflection at the end of each semester. The reflection allows a faculty member to summarize the results of the course, map the appropriate objectives and outcomes to the course and identify successes from the semesters, opportunities for improvement, puzzles (i.e., questions to be resolved), suggested changes, issues with facilities, technology issues, and other reflections.

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Criteria for Success (Thresholds for Assessment Methods):

Direct Assessment

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- *Formative Assessment:* 70% of students in Excelling, Practicing, or Apprentice. Formative assessments provide us with "mid-term" knowledge of attainment and provide a comparative measure by which to identify whether students are making progress in the program.

Indirect Assessment

Pre-Post Surveys (Pre-Post): Pre-post surveys are conducted for courses in which a direct assessment is scheduled. The pre-post survey is administered twice: once at the beginning of a semester and again at the end of a semester. The results of the pre-post survey is measured using a Student's T-Test to determine whether a statistically significant change in a student's perception of learning is observed. Any measurement of the T-Test that results in a p-value of 0.05 or lower is deemed as significant.

In regards to attainment levels, we expect the following: Student perceptions should exhibit a change in the aggregate mean towards “Extremely Well”. Achieving a p-value of 0.05 is desirable but secondary.

Link to 'Tech Tomorrow' Strategic Plan:
2.A Technology Infused Programs

Results and Analysis:
Outcome 5: Function effectively as a member or leader of a team engaged in activities appropriate to the program’s discipline.

Program Threshold: At least 70% of students must perform at Excelling or Practicing levels for the outcome to be considered met.

CSC 3040 – Professionalism, Communication, and Research (Spring 2025)
Trait 1: Team-based Tutorial Development
Group Contract with Signatures: 92.1% Excelling, 7.9% Practicing → ✅ Met
Peer Evaluation of Group Members: 84.2% Excelling, 7.9% Practicing → ✅ Met
Combined Result: 88.2% Excelling + Practicing → ✅ Threshold Met

Trait 2: Ethical Group Discussions
Ethics Case Study Assignment: 42.1% Excelling, 34.2% Practicing → ❌ 67.3% Total
In-Class Discussion on Networked Communications: 68.4% Excelling, 23.7% Practicing → ✅ Met (92.1%)
In-Class Discussion on Intellectual Property: 92.1% Excelling → ✅ Met
Combined Result: 67.5% Excelling + Practicing → ❌ Below Threshold
Conclusion: Only Trait 1 met the 70% threshold. Students performed well in structured, collaborative projects, but their performance in unstructured ethical discussions was mixed. Outcome 5 is partially met in CSC 3040.

CSC 4610/4615 – Software Engineering I & II (Fall 2024 & Spring 2025)
Trait 1: Creating and Managing a Plan
Project Charter: 35% Excelling, 46% Practicing → 81% Total → ✅ Met

Trait 2: Tracking and Managing a Plan
Student Progress (Kanban): 78% Excelling → ✅ Met
Iteration Reports: 67% Excelling, 22% Practicing → 89% Total → ✅ Met

Trait 3: Producing Deliverables

Project Showcase Demo: 89% Excelling, 11% Practicing → 100% Total → ✅ Met

Conclusion: All three traits exceeded the threshold, demonstrating strong ability to function effectively in teams over extended project timelines. Outcome 5 is fully met in CSC 4610/4615.

Overall Summary

Course	Trait 1 Met?	Trait 2 Met?	Trait 3 Met?	Outcome 5 Met?
CSC 3040	✅ Yes	❌ No	—	❌ Partially
CSC 4610/15	✅ Yes	✅ Yes	✅ Yes	✅ Fully

Use of Results to Improve Outcomes:

The assessment of Outcome 5 across CSC 3040 and CSC 4610/4615 shows mixed results. Students in CSC 4610/4615 consistently met or exceeded the 70% threshold in all measured traits, indicating strong teamwork, planning, project tracking, and deliverable creation throughout their capstone experience. In contrast, CSC 3040 students met the threshold for team-based project work but fell short in ethics-related group discussions, where only 67.5% performed at acceptable levels. These results suggest that while students can collaborate effectively on structured tasks, additional support is needed for engaging in critical, collaborative reasoning around ethical scenarios. Overall, Outcome 5 is fully met in the senior sequence but only partially met in the junior-level CSC 3040.

SLO 6. Apply computer science theory and software development fundamentals

Define Outcome:

Students can apply computer science theory and software development fundamentals to produce computing-based solutions.

This outcome is as defined by the Accreditation Board for Engineering and Technology (ABET) Computer Science Accreditation Commission (CAC).

Assessment Methods:

Direct Assessment. Several courses are assessed every semester. These assessments directly examine student work based on traits (performance criteria) created specifically for each student outcome. The measurement rubric used for direct assessment uses a four-level rubric: Excelling, Practicing, Apprentice, and Novice (E/P/A/N). These criteria are performed on a per student basis. An example is provided below.

Performance Criteria (Traits):

- Students can apply computer science theory and software development fundamentals to design computing-based solutions. (Bloom's taxonomy level: Apply)
- Students can apply computer science theory and software development fundamentals to implement computing-based solutions. (Bloom's taxonomy level: Apply)

Faculty Course Reflections (all courses): Each faculty member is asked to complete a course reflection at the end of each semester. The reflection allows a faculty member to summarize the results of the course, map the appropriate objectives and outcomes to the course and identify successes from the semesters, opportunities for improvement, puzzles (i.e., questions to be resolved), suggested changes, issues with facilities, technology issues, and other reflections.

Pre-Post Surveys (Pre-Post): Pre-post surveys are conducted for courses in which a direct assessment is scheduled. The pre-post survey is administered twice: once at the beginning of a semester and again at the end of a semester.

Criteria for Success (Thresholds for Assessment Methods):

Direct Assessment

- *Summative Assessment:* 70% of students in Excelling or Practicing. Summative assessments capture the "end-game" so to speak and so we use this measure to kick-off identification of action items.
- *Formative Assessment:* 70% of students in Excelling, Practicing, or Apprentice. Formative assessments provide us with "mid-term" knowledge of attainment and provide a comparative measure by which to identify whether students are making progress in the program.

Indirect Assessment

Pre-Post Surveys (Pre-Post): Pre-post surveys are conducted for courses in which a direct assessment is scheduled. The pre-post survey is administered twice: once at the beginning of a semester and again at the end of a semester. The results of the pre-post survey is measured using a Student's T-Test to determine whether a statistically significant change in a student's perception of learning is observed. Any measurement of the T-Test that results in a p-value of 0.05 or lower is deemed as significant.

In regards to attainment levels, we expect the following: Student perceptions should exhibit a change in the aggregate mean towards "Extremely Well". Achieving a p-value of 0.05 is desirable but secondary.

Link to 'Tech Tomorrow' Strategic Plan:

2.A Technology Infused Programs

Results and Analysis:

Outcome 6: Apply computer science theory and software development fundamentals to produce computing-based solutions.

Threshold Standard: At least 70% of students should perform at the Excelling or Practicing levels.

CSC 2310 – Object-Oriented Programming and Design (Spring 2025)

Trait 1: Apply theory and fundamentals to design solutions

Assessed through three design-phase assignments:

- User Stories: 70.6% A/B → ✅ Met
- Use Case Diagram: 74.2% A/B → ✅ Met
- Class Diagram: 95.8% A/B → ✅ Met

Result: Design performance met the 70% threshold across all artifacts.

Trait 2: Apply theory and fundamentals to implement solutions

Assessed over three programming iterations:

- Iteration 1: 90.3% A/B → ✅ Met
- Iteration 2: 83.9% A/B → ✅ Met
- Iteration 3: 87.1% A/B → ✅ Met

Result: Implementation performance clearly exceeded the 70% threshold in all cases.

Conclusion: CSC 2310 students consistently met or exceeded the threshold for both design and implementation components. Student understanding improved across iterations, though common design errors (e.g., narrow user stories, incorrect UML) and coding issues (e.g., naming mismatches, formatting bugs) suggest areas for further practice and debugging support.

CSC 4575 – Cryptography and Network Security (Spring 2025)

Trait 1: Apply theory to design solutions

Assessed using a cryptanalysis assignment (Caesar and Vigenère cipher challenges):

- 66% Excelling, 23% Practicing → 89% Total → ✅ Met

Trait 2: Apply theory to implement solutions

Assessed through a PKI implementation lab:

- 69% Excelling, 21% Practicing → 90% Total → ✅ Met

Conclusion: CSC 4575 students met Outcome 6 criteria with strong performance on both cryptographic design and implementation activities. Although the assignments were technically demanding, students demonstrated competency in applying theoretical knowledge to solve structured and practical security problems.

Overall Summary

Course	Trait 1 (Design)	Trait 2 (Implementation)	Outcome 6 Met?
CSC 2310	✅ Yes	✅ Yes	✅ Yes
CSC 4575	✅ Yes	✅ Yes	✅ Yes

Indirect assessment

Reflections from CSC 2310 (Fall 2024 and Spring 2025) and CSC 4575 (Spring 2025) reveal a strong emphasis on applying theory to solve problems, with mixed success across courses. In both offerings of CSC 2310 – *Object-Oriented Programming and Design* – instructors observed that students showed improved ability to connect conceptual material like UML diagrams and object-oriented design principles to practical coding assignments. Stewart's "I do, we do, you do" approach and alignment between lecture and lab helped bridge the gap between theoretical content and hands-on implementation. Similarly, Strickler noted that students performed well on the software development project, although some struggled with exceptions and error handling—areas where theoretical knowledge was harder to apply effectively.

In CSC 4575 – *Cryptography/Network Security*, students were generally engaged with the theoretical content, particularly in lecture discussions, but faced challenges translating that knowledge into hands-on exercises. Despite TA-led lab walkthroughs, students struggled with applied tasks, likely due in part to technical issues with the cyberrange environment and inconsistency in lab accessibility. This indicates that while students may grasp foundational concepts, there remains a need for improved support and scaffolding to successfully apply theory in complex, real-world scenarios. Across all courses, instructors suggested enhancing pacing, increasing practice opportunities, and refining lab support as strategies to improve students' ability to move from understanding to effective problem-solving.

Use of Results to Improve Outcomes:

The assessment of Outcome 6 across CSC 2310 and CSC 4575 shows that students effectively met the 70% threshold in both design and implementation of computing-based solutions. In CSC 2310, students improved steadily through the semester, with high achievement in UML diagrams and implementation iterations, though persistent challenges with debugging and diagram clarity suggest room for additional support. In CSC 4575, students performed well on technically rigorous cryptanalysis and public key infrastructure tasks, demonstrating the ability to apply foundational theory to practical, real-world security problems. Overall, Outcome 6 is fully met in both courses.

Summative Evaluation:

As part of our department's ABET assessment activities, we perform an analysis every accreditation cycle. The results from our assessment of Outcomes 1 - 6 are reviewed and used by our undergraduate committee to determine changes needed based on student performance. Other assessments are used to assist in making curricular changes.

Key Recommendations by Outcome

Outcome 1: Analyze complex computing problems

Strengthen instruction in user story development and effort trade-off analysis in CSC 4610 to improve performance in open-ended, real-world scenarios.

Outcome 2: Design, implement, and evaluate computing-based solutions

Introduce early-semester design activities in CSC 3300 and improve instructional scaffolding for UML diagrams in CSC 2310 to support design thinking.

Outcome 3: Communicate effectively in professional contexts

Provide more structured support for procedural writing in CSC 3040 to strengthen student performance in technical documentation.

Outcome 4: Recognize professional responsibilities and make informed legal and ethical judgments

Introduce a standalone ethics course and scaffold legal content across the curriculum to build deeper competence in legal application and professional responsibility.

Outcome 5: Function effectively on teams

Enhance support for collaborative ethical discussions in CSC 3040 by clarifying expectations and providing structured facilitation to promote equitable participation.

Outcome 6: Apply theory and software fundamentals to produce solutions

Increase focus on debugging and verification strategies in CSC 2310 and strengthen lab support in CSC 4575 to support application of theoretical knowledge.

Assessment Plan Changes:

No changes are being made to outcomes or assessment approaches for the next cycle.

Appendix 1: Curriculum Map

	Outcome Relevancy Level (L = Low or None, M = Medium, H = High)					
	1	**2**	**3**	**4**	**5**	**6**
CSC 1200 - Principles of Computing	H	H	L	L	L	L
CSC 1300 - Intro to Problem Solving and Computer Programming	H	H	L	L	L	L
CSC 1310 - Data Structures and Algorithms	H	H	L	M	L	H
CSC 2310 - Object-Oriented Programming and Design	H	H	L	L	L	H
CSC 2400 - Design of Algorithms	H	H	L	L	L	M
CSC 2500 - Unix Laboratory	L	L	L	L	L	L
CSC 2560 Networks for Information Technology	H	H	L	L	L	H
CSC 2700 - Discrete Structures for Computer Science	L	L	L	L	L	L
CSC 3020 Numerical Methods	H	H	L	L	L	M
CSC 3040 – Professionalism, Communication, and Research in Comp	L	L	H	H	L	L
CSC 3220 Fundamentals of Data Science	H	H	M	M	M	L
CSC 3230 Healthcare Data Analytics	H	H	M	H	L	H
CSC 3300 - Database Management Systems	M	M	L	L	L	M
CSC 3410 - Computer Organization and Assembly Lang Programming	H	M	L	L	L	M
CSC 3710 - Foundations of Computer Science	M	M	L	L	L	M
CSC 4010 Programming Languages	H	H	L	L	L	H
CSC 4040 Undergraduate Computing Research Experience	H	H	M	M	L	H
CSC 4100 (5100) - Operating Systems	M	L	L	L	L	H
CSC 4200 (5200) – Computer Networks	M	M	L	L	L	H
CSC 4220 Data Mining and Machine Learning	H	H	M	M	M	L
CSC 4240 Artificial Intelligence	M	L	L	M	M	L
CSC 4320 (5320) - Computer Architecture	M	L	L	L	L	M
CSC 4400 Analysis of Algorithms	H	M	L	L	L	M
CSC 4570 IT Security	H	L	M	H	H	L
CSC 4575 Information Assurance and Cryptography	H	L	H	H	H	L
CSC 4580 Software Reverse Engineering	H	H	L	L	L	H
CSC 4610 - Software Engineering I	H	H	H	H	H	H
CSC 4620 - Software Engineering II	H	H	H	H	H	H
CSC 4710 Design and Development of Human/Web Interfaces	H	H	M	M	M	H
CSC 4750 Computer Graphics	H	M	L	L	L	H
CSC 4760 Parallel Programming	M	H	L	L	L	H
CSC 4770 Distributed and Cloud Computing	M	H	L	L	L	L
CSC 4990 Computer Science Internship	M	M	H	H	H	M