Computer Science - Bachelor of Science - Mid-Cycle Review & SLOA Year

Current Compliance Year: 2022-2023
Mid-Cycle review

Recent Recommendations

Feedback will include recommendations from the last Expedited Review or from your most recent review by your school or college. You may not see any feedback or recommendations until you have completed your first full or mid-cycle review.

Response to Previous Recommendations (if any):

"Develop online options for working students": Post COVID, we have experience offering courses 100% online now, and regularly offer synchronous distance as an option for students. Degree completion rates for fully online students are low, however: many students exited the program or postponed during COVID, while our in-person Fall 2022 incoming class is a record size.
"Explore curricular revisions to make degree more attainable": In 2021 we added a CS 241 circuits course that uses Arduino to teach interactive C++ programming in an interesting and friendly context. This change was at the EE department's request in 2019, replacing EE 341 which they taught for us. In 2022 we added a CS BA option to the catalog, which replaces the 14 credits of math beyond Calculus I in the CS BS with more electives, humanities, and a minor complex.
"Develop a plan to increase gender diversity.": See our Equity Gaps response below.

Student Learning Outcomes

The previous Student Learning Outcomes Assessment has been submitted as its own report. Going forward you will use the following prompts to discuss the success of your most recent SLOA plan and address your assessment activities since your last SLOA report (typically the past two years or since your last program review).

Learning outcomes feedback from last review:

Feedback will be provided once you have completed a full or mid-cycle review.

Discuss your SLOA findings, changes you are making and what you hope to see as a result:

From Fall 2018 to Spring 2022 we collected and assessed a total of 34 indicators of student achievement of learning outcomes, primarily to maintain the CS BS degree's ABET accreditation. In 2019 we updated our indicators to match the ABET CAC 2.0 assessment criteria. Each semester we collect data in a few courses, and each year we have an assessment meeting to examine, discuss the data, and close the loop with specific recommendations. Assessment is based, depending on the indicator, on student performance in homework problems, exam questions, or in-class presentations. The curricular changes listed below are taken directly from our summary report on our assessment process. This is also the time that the assessment committee looks at cross-cutting issues across all courses/curriculum.

Discuss the curricular changes made based on assessing your SLO. If you haven't made any curricular changes, please explain why not and address what you did notice in the review, including strengths of your curriculum through the assessment of your outcomes:

All Courses
Students need more practice reading, understanding, and reasoning about complex codebases.
Improve student estimation abilities: have students track their time (1) pre estimate in design phase, and (2) postmortem analysis.
CS 201 and 202: CS I and II
Consider discussing Kanban starting in 202.
CS 301: Assembly Language Programming
Explicit examples of "how to apply abstraction to solve a problem".
CS 311: Data Structures & Algorithms
Give some examples where O(n) or O(n^2) depending on the definition of n.
CS 321: Operating Systems
Refresher coverage on buffer overflow in 321, motivates malloc implementation, least privilege on network servers.
CS 371: Computer Ethics & Technical Communication
Teach tools for making good diagrams in 371.
Teach UML diagrams.
Cover both minimum legal standards and best practices for using code from the internet.
Emphasize that any story has a beginning, middle, and end.
Students need to practice their talks.
Code examples are the best way to introduce a new programming language.
Explicitly distinguish microfocus (code, repo management) vs macrofocus (features customers need, project goals).
CS 372: Software Construction
We need to emphasize how important requirements gathering is in real projects. Give requirements as a separate deliverable.
While gathering requirements, need formal process for communication/follow-up with customer.
CS 471: Senior Capstone I
Describe how you need "specified" and "done" columns if using Trello for Kanban

Are communication outcomes embedded in the SLOA Plan?
As of 2017 all Baccalaureate programs were required to embed the communication outcomes within their SLOA Plans, this is optional for non-Baccalaureate programs.

Embedded

Student Success

To access the Student Success Dashboard please sign into a UA computer with VPN connection (if not on campus). You will need your UA credentials and it is best accessed with the most updated version of Chrome, Edge, Firefox or Safari browsers; Internet Explorer is not supported. You will need to filter the data to see your programs. If you need assistance in finding the data for your programs, please contact your data liaison or Julia Manfredini in the PAIR office.

Data Liaisons

Each school or college has a team of Data Liaisons to help you analyze the data provided in the portal and may be able to help you see your data in multiple contexts. You can find a list of data liaisons on the resources page for Program Review.

The college or school level committee will also have access to this data with the goal that by providing these visualizations data availability will be increased.

Data supplied within the dashboard linked below is intended for Academic Program Review and not for any other purpose.

Student Success Data Dashboard

Previous Feedback

Feedback will be provided once you have completed a full or mid-cycle review.

Student Success Data Trends:

Decline in majors

If equity gaps were found in any of your disaggregated student success data, please explain how you plan to address those gaps. Please contact your data liaison or make an appointment with Julia Manfredini to learn more about analyzing your data.

CS has a highly male-skewed gender ratio, both nationally and here at UAF. This has been becoming increasingly skewed in recent decades, with national NSF data showing a drop from [redacted] in 1995 to [redacted] in 2012. This is despite the field's deeply female history, with pioneers including Ada Lovelace (first programmer), Grace Hopper (originator of COBOL), and Margaret Hamilton (Apollo guidance computer). UAF's CS program originated in the math department, and our curriculum has a large amount of advanced math. Yet Calculus, particularly Calculus II, has been identified in research as a key impediment to [redacted] pursuing STEM careers (Ellis et al, 2016 https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0157447). Our hope is that offering the new minimal-calculus degree path of the CS BA, approved in May 2022, will help improve the gender ratio in CS. So far 50% of our CS BA applicants are [redacted]. Aspects of CS have been interpreted as antisocial, and an introverted "man vs machine" description of individual homeworks and machine problems might be encouraging this distorted view, particularly in crucial 200 and 300 level coursework. Real world programming tends to be much more interdisciplinary and adapted to its social context, which may appeal to a broader group of students, so we've begun discussing how to get more of this collaborative style of problem solving into lower level courses.

Optional Data Explanation

Feel free to share more of your thoughts on the data provided.

In looking at our enrollment data, recall that 2019 was Governor Dunleavy's proposed huge cuts to UA funding, which actually encouraged many students to come back and finish their degrees. As COVID hit, we were working through the last of this temporary "get your degree while you can" boom, and the incoming first-year classes of fall 2020 and fall 2021 were much smaller than normal. The incoming class in fall 2022 is much larger than normal, so after a few years of low degree production we expect to be back to a stable level.

High Impact Practices

According to the AAC&U, High-Impact Educational Practices "have been widely tested and have been shown to be beneficial to college students from many backgrounds." UAF is particularly interested in Undergraduate Research and/or Scholarly Activity because it is one of our mission fulfillment indicators, but all of these researched High-Impact Educational Practices should be reflected in your program's student learning outcomes and curriculum.

Previous Feedback

Feedback will be provided once you have completed a full or mid-cycle review.

High-Impact Practices Used in this Program

Please use the following fields to discuss how your program is using the high-impact practices, successes and known issues and solutions, or ways you are considering incorporating them in the future. If you are not using any of the high-impact practices listed, please use the "Other or None of These," filed to share what your program is doing to help students be successful.

High Impact Practices that currently apply to your program:

Capstone Courses and Projects,Collaborative Assignments and Projects

Other or None of these (explain)

Submission

Submitter & Collaborator Names

Dr. Orion Lawlor

Submitter Email

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College or School Review Committee

The college or school committees set the tone for helping each program feel seen during this process. We have provided you with strength-based feedback tags to attach to this program review. Please select as many as applicable.

Overall Recommendations

Develop online offerings/options,Consider curricular revisions,Address equity gap

Explanation of Recommendations

Develop online options for working students, explore curricular revisions to make degree more attainable.
Develop a plan to increase gender diversity.

Student Learning Outcomes Assessment Feedback (tags)

Strong alignment with SLOA plan,Compelling learning story

Student Learning Outcomes Assessment Feedback (narrative)

SLOA is strong and well aligned with ABET. The program shows strong alignment between the plan, the results, and the analysis done by the program. The curricular changes made are directly tied to outcomes assessment and analysis.

Profile Feedback

Financial Feedback

Student Success & Equity Feedback

The program does a nice reflection of the equity gaps for [redacted] in the program. They identify advanced calculus (CALC II) specifically as a barrier to [redacted], and discuss how they are creating a new BA Calculus that is a "minimal-calculus degree path" to address this equity gap. The reflection of the gender-gap is very thoughtful, however, it appears to reflect the idea that [redacted] can not do advanced math and the program needed to develop something less in order to bring [redacted] up. This is in spite of the pioneering [redacted] in the field's history. What other attempts have been made to determine if it's more the way it's being taught and less about the content, or some other factor? It will be good to see how the new BA in CS impacts the equity gap.

High-Impact Practices Feedback

The program identifies two HIPS- capstone projects, and collaborative assignments. The committee would like to have seen more discussion in how these two HIPS are integrated within the program. The program does talk about the individual degree plan and supportive advising that is implemented and this should be helped by the new Nanook Navigator academic planner.

UNIVERSITY OF ALASKA FAIRBANKS

Student Learning Outcomes Assessment Plan

Bachelor of Science in Computer Science

College of Engineering and Mines

2021

Expanded Statement of Institutional Purpose	Intended Objectives/Outcomes	Assessment Criteria and Procedures	Implementation (what, when, who)
MISSION STATEMENT: To provide quality education consistent with the requirements of the Computing Accreditation Commission of ABET and the recommendations of the UAF Computer Science Industry Advisory Board, which is responsive to the needs of individual students and the diverse population of Alaska **GOAL STATEMENT:** The faculty of the Department of Computer Science at UAF provides a positive learning environment that enables students to pursue their goals in an innovative program that is rigorous, challenging and supportive The B S program develops practical skills by emphasizing hands-on experience in the design, implementation, and validation of computer systems in an environment that fosters and encourages innovation and creativity This approach builds the foundation for the following program educational objectives: 1. Breadth: Graduates will utilize their broad education emphasizing computer science to serve as the foundation for productive careers in the public or private sectors, graduate education, and lifelong learning	1: Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions	A1 - Data structure A2 Big O Iterative A3 Big O Recursive B1 Problem complexity	(Details are in CS Assessment Matrix, part of CS annual Assessment Report for ABET) A1-3: Fall 2021, CS 411 B1: Fall 2021, CS 411
	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.	B2 - Abstraction C1 Design algorithm C3 System diagram	B2: Fall 2021, CS 411 C1 Fall 2021, CS 411 C3 Spring 2023, CS 372
	2 a Implement	I1 Unit tests I2 Optimize performance I3 - Development process	I1 Fall 2023, CS 311 I2 Fall 2023, CS 301 I3: Spring 2023, CS 472
	2.b: Evaluate	C2 - Measure performance G1 - Framework impact G2 Global impact E4 Security issues	C2: Fall 2023, CS 301 G1: Fall 2021, CS 371 G2 Spring 2023, CS 472 E4 Spring 2023, CS 321
	2 c Requirements	B3 Requirements	B3 Spring 2022, CS 372
	3 Communicate effectively in a variety of professional contexts	F1 White paper F2 In person presentation F3 - Technical summary F4 - Developer documentation F5 Video presentation D7 Group presentation	F1 Fall 2023, CS 471 F2 Spring 2023, CS 321 F3: Fall 2022, CS 471 F4: Fall 2023, CS 372 F5 Spring 2024, CS 331 D7 Spring 2024, CS 472
	4 Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.	E1 Apply ethics E2 Software license E3 - Ethical decisions	E1 Fall 2022, CS 371 E2 Fall 2023, CS 371 E3: Spring 2022, CS 472

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2 Depth Graduates will apply the fundamental knowledge that is prerequisite for the practice of and/or advanced study in computer science.	5 Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline	D3 Group project D5 - Group meetings D7 - Group presentation	D3 7 Spring 2024, CS 472
3 Professional Skills Graduates will apply skills for clear communication, effective teamwork, professional attitudes and ethics to succeed as a professional	6: Apply computer science theory and software development fundamentals to produce computing based solutions.	A1 - Data structure B1 Problem complexity B2 Abstraction C1 - Design algorithm I3 - Development process	A1: Fall 2021, CS 411 B1, B2 Fall 2021, CS 411 C1 Fall 2021, CS 411 I3: Spring 2023, CS 472

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