WASHINGTON STATE UNIVERSITY
Office of the Provost

MEMORANDUM

TO: Faculty Senate

FROM: Elizabeth S. Chilton, Provost and Executive Vice President

SUBJECT: Create a Bachelor of Science in Cybersecurity

DATE: November 8, 2022

The attached proposal to create a Bachelor of Science in Cybersecurity (BSCyber) degree has been reviewed by the Provost's Office, and we support the proposal.

The proposed new BSCyber degree program aims to meet the growing demand for computer scientists with expertise in cybersecurity. In addition to learning in traditional computer science courses, students will take classes and learn crosscutting concepts and skills in confidentiality, integrity, privacy, risk, and adversarial thinking. The curriculum will include topics on security related to data, software, connection, cyber systems, and cybersecurity threats impacting organizations and society.

The proposed BSCyber program will be complementary to the existing BS in Computer Science and BS in Software Engineering programs at WSU. As sister disciplines, computer science (CS), software engineering, and cybersecurity share the fundamentals of a computer science curriculum. Where they differ is in advanced courses—CS focuses on topics in machine learning, data science, algorithm design, distributed and networked systems, human-computer interfacing, pervasive computing, bioinformatics, and other topics of interest to the students. SE focuses on advanced courses in software design and development, software testing and validation, software maintenance, software security, and software management and integration. Cybersecurity focuses on security related to data, software, connection, cyber systems, and cybersecurity threats impacting organizations and society. Graduates in all three disciplines are in high demand among Washington state's computing and information technology industries.

We judge the proposal ready for the Senate review process.

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PROPOSAL TO OFFER A NEW DEGREE PROGRAM OR EXTEND AN EXISTING DEGREE TO GLOBAL CAMPUS

Degree Title:	Bachelor of Science, Cybersecurity
Academic Program:	Cybersecurity, BS
Academic Plan:	Cybersecurity BS
Number of Credits:	121
Department(s) or Program(s):	School of Electrical Engineering and Computer Science (Pullman, Everett) School of Engineering and Applied Sciences (Tri-Cities)
College(s):	Voiland College of Engineering and Architecture
Campus(es):	Pullman, Everett, Tri-Cities
Method of Instructional Delivery:	Face-to-face, Videoconference (VC)

Contact Name:	K. Sivakumar	Email Address:	siva@wsu.edu
Contact Phone:	509-335-4969	*Proposed start date:	Fall 2023

***Proposed Start Date:** Approval must be received from the Northwest Commission on Colleges and Universities before the program may be advertised or recruited for. Financial aid may not be available until the program has been approved by the Department of Education subsequent to NWCCU approval.

SIGNATURES: The names typed below certify that the relevant academic and campus officials have reviewed and approved this proposal:

Chair Signature:	Dr. Partha Pande Dr. Changki Mo	Date:	
Dean Signature:	Dr. Mary Rezac	Date:	
VP Global Campus	Dr. Dave Cillay	Date:	

→ Submit to the Provost's Office at provost.deg.changes@wsu.edu

Everett Chancellor	Dr. Paul Pitre	Date:	
Spokane Chancellor	Dr. Daryll DeWald	Date:	
Tri-Cities VCAA	Dr. Kathleen McAteer	Date:	
Vancouver VCAA	Dr. Renny Christopher	Date	
Provost Office:		Date:	

Comments:

For Registrar's Office Use Only:					
Current CIP Code:		New CIP Code:		Date:	

Send completed form in Word format to: provost.deg.changes@wsu.edu

This template asks you to answer the array of questions about your proposed program that are important to your department, your college, the Faculty Senate, the State of Washington, accreditors and other external stakeholders.

By placing all proposals in a similar format, this template provides a common standard for comparison, ensuring that all potential programs can be evaluated in an equitable fashion. It can be used to determine whether or not a program is feasible within the university's academic and financial situation, and if it will have the resources to further the University's objective of providing high quality education and scholarship.

This template is also a framework to think about the viability of your ideas. It can thus be a tool for strengthening both your proposal and the resulting program itself, since a program that is starved for either students or resources from its inception is not likely to become a high quality program.

Here are some of the things to consider as you complete the template:

> What are the aspirations for the reputation of this program – local, regional, national? What will it take to make that a reality?
> Who are you trying to attract with this new program? Will it bring new students to the university, better meet the needs of current students in the department, or draw students away from other departments?
> How strong is the demand for education of this kind, and in what specific careers will someone who receives such an education find meaningful employment?
> How many students do you need to attract to break even, and can both the market and WSU's capacity support this number?

Providing good answers to hard questions maximizes the likelihood that a new program will not just win acceptance by the Faculty Senate and administration, but will ultimately be successful in attracting students and placing graduates. The analyses in the Demand, Financial and Library workbooks will assist you in creating a persuasive proposal. The findings in each area, and their basis or justification, should be summarized in the proposal itself.

Proposal

Mission and Core Themes (Strategic Goals):

Provide a clear statement of the nature and purposes of the new degree in the context of WSU's mission and core themes (strategic plan).
The proposed new Bachelor of Science in Cybersecurity (BSCyber) degree program aims to meet burgeoning demand for computer scientists with expertise in cybersecurity. In addition to learning in traditional computer science courses, students will take classes and learn crosscutting concepts and skills in confidentiality, integrity, privacy, risk, adversarial thinking. The curriculum will include topics on security related to data, software, connection, cyber systems, and cybersecurity threats impacting organizations and society. The proposed BSCyber program will be complementary to the existing BS in Computer Science (BSCS) and BS in Software Engineering (BSSE) programs at WSU. As sister disciplines, computer science (CS), software engineering (SE), and cybersecurity share the fundamentals of a computer science curriculum. Where they differ is in advanced courses—CS focuses on topics in machine learning, data science, algorithm design, distributed and networked systems, human computer interfacing, pervasive computing, bioinformatics, and other topics of interest to the students. SE focuses on advanced courses in software design and development, software testing and validation, software maintenance, software security, and software management and integration. Cybersecurity focuses on security related to data, software, connection, cyber systems, and cybersecurity threats impacting organizations and society. Graduates in all three disciplines are in high demand among Washington state's computing and information technology (IT) industries. It is aligned with and reflects WSU's mission and core themes: • Produce highly qualified, much in demand, cybersecurity professionals. • Provide access to high-quality baccalaureate degrees in science and engineering in Pullman, the North Puget Sound and Tri-Cities regions. Produce work-ready graduates with experiential education and training. • Meet the workforce needs of the state and region. • Foster research in Cybersecurity at WSU.

Educational Offerings:

Describe the degree program, including the total number of credits required. Provide the four-year degree plan (undergraduate) or appropriate plan of study (graduate and professional). Please note that all courses for the degree must be approved before the degree will be reviewed by the Catalog Subcommittee.
The proposed BSCyber degree program would train students to design and build secure information networks, security tools such as firewalls, and secure methods of transporting data. The four-year degree plan is attached as a separate file and requires 121 semester credit hours. We have also included as an attachment, an explanation of the Lab Science Requirement in the 4-year program as it relates to UCORE, professional accreditation requirement, and transfer students.

Provide descriptive information regarding (the) method(s) of instructional delivery (percent face-to-face, hybrid, distance, and/or competency-based).

The BSCyber degree program will be offered in Pullman, Everett, and Tri-Cities campuses. Courses will be delivered by a combination of camps-based face-to-face courses and courses delivered via Videoconference (VC) across campuses. All the courses required for the BSCyber program---UCORE, foundational Math, Science, courses in the major---will be offered at the Pullman and Tri-Cities campuses.

At the Everett campus, BSCyber program will be a degree completion program, similar to the existing BS Mechanical Engineering (ME), BS Electrical Engineering (EE), and BS Software Engineering programs offered at Everett. In particular, lower division portion of the curriculum will be offered by the regional community colleges through the Associate of Science for Transfer (AS-T) degree. The CS, SE and (newly hired) Cybersecurity faculty in Everett will jointly offer the upper division curriculum. Some upper-division courses will be offered via VC across campuses.

Offerings at all campuses are intended to be day-time programs designed for full-time students; part-time students will be accommodated as needed. No special faculty or student training is necessary for the planned delivery modes.

Assessment of Student Learning and Student Achievement
*** For graduate programs, please contact the Graduate School before completing this section.**

Please provide a list and description of expected student learning outcomes.

The current undergraduate programs offered by the School of EECS and SEAS are professionally accredited by the Engineering Accreditation Commission (EAC) or Computing Accreditation Commission (CAC) of ABET. We will be seeking similar professional accreditation for BSCyber once the program is approved and we meet the requirements for professional accreditation.

The student learning outcomes (SLOs) for BSCyber program are aligned with the requirements for professional accreditation through the Computing Accreditation Commission (CAC) of ABET. Below we list the SLOs and associated performance indicators for their assessment for the BSCyber degree program.

1. ***An ability to identify, formulate, analyze and solve complex computing and engineering problems by applying principles of engineering, computing, science, mathematics, and other relevant disciplines.***
   Performance Indicators:
   a. Decomposes a real-world scenario or problem statement into set of subproblems that need to be addressed in order to solve the original problem.
   b. Identifies constraints and/or requirements of a problem.
   c. Formulates problems in such a way that they can be addressed through approaches appropriate to the discipline, including approaches from engineering, computing, science, and mathematics.
   d. Chooses an approach, method, or tool that is appropriate to addressing the problem at hand.
   e. Applies principles, methods, or tools from engineering, computing, science, mathematics, and/or other relevant disciplines to identify viable approaches and correctly solve problem.

2. ***An ability to design, implement and evaluate engineering and computing solutions that meet specified requirements with consideration of public health, safety, and welfare concerns, as well as global, cultural, social, environmental, and economic factors.***
   Performance Indicators:
   a. Formulates one or more viable designs to meet a given set of needs/requirements.
   b. Articulates tradeoffs among multiple solutions that meet given set of needs/requirements.
   c. Identifies considerations, constraints and factors within problem context that are relevant to meeting specified needs/requirements.
   d. Prioritizes considerations, constraints, and factors that are relevant to meeting specified needs/requirements based on sound rationale.
   e. Applies appropriate strategies to evaluate the ability of a solution to meet specified requirements.

f. Demonstrates sensitivity to a range of considerations (e.g., public health, safety, welfare) and factors (e.g., global, cultural, social) when developing solutions.
g. Implements one or more solutions to meet specified needs/requirements.

3. ***An ability to communicate effectively with a range of audiences in a variety of professional contexts.***
Performance Indicators:
a. Applies standard rules of grammar, syntax, and structure in written and oral work.
b. Demonstrates use of conventions particular to the discipline (e.g., organization, language choice, document type, source citation guidelines, and stylistic choices) in writing and presentations.
c. Considers context, audience, and purpose in writing and presentations.
d. Uses sources, examples, analogies, illustrations, and statistics to support claims.
e. Uses graphical materials (e.g., illustrations, tables, schematics, photos, etc.) to support and extend the verbal or written components of documents and presentations.
f. Uses delivery techniques such as posture, gesture, eye contact, enunciation, voice projection, vocal expressiveness to engage the audience during oral presentations.

4. ***An ability to recognize ethical and professional responsibilities in engineering and computing situations and make informed judgments based on legal and ethical principles, and with consideration of global, economic, environmental, and societal impacts.***
Performance Indicators:
a. Identifies professional, ethical, legal, security, and societal dimensions of a decision or action and its potential impacts on individuals, companies/organizations, the public, and/or other relevant stakeholders.
b. Articulates cost, schedule, and risk components of a computing or engineering project with consideration of ethical impacts.
c. Recognizes and distinguishes between different or competing ethical theories, frameworks, and/or perspectives relevant to computing or engineering scenario.
d. Applies the standards of a professional code of ethics to determine an appropriate course of action.
e. Uses an ethical theory, framework, or perspective to analyze a computing or engineering scenario and identify acceptable courses of action.
f. Explains professional, ethical, and social considerations in an engineering or computing context.

5. ***An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.***
Performance Indicators:
a. Performs actions that demonstrate leadership in interactions with team members.
b. Performs actions that support team members in team interactions.
c. Demonstrates effort to include all team members in efforts and decisions of team.
d. Demonstrates ability to establish goals, plan tasks, and meet objectives in a team environment.
e. Fulfills different roles on teams and in meetings.
f. Fulfills individual responsibilities outside of team meetings.
g. Provides feedback; seeks and is receives feedback; and is exposed to different approaches and/or perspectives of team members.

6. ***An ability to apply appropriate security principles and practices, computing and engineering approaches, theories, and fundamentals to conduct appropriate experimentation, analyze and interpret data, use engineering judgment to maintain operations in the presence of risks and threats, draw conclusions, and produce solutions.***
Performance Indicators:
a. Applies engineering or computing theory and/or security principles/approaches to develop solutions.
b. Applies testing and experimentation approaches/methods to evaluate cybersecurity threats to system operation.
c. Applies security principles and practices to maintain operations in the presence of risks and threats.

d. Applies testing and experimentation approaches/methods to managing risks in system operation.
e. Identifies tests, data, and/or analyses that are needed to draw conclusions and/or make decisions.

7. ***An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.***
Performance Indicators:
a. Determines the extent and type of information needed for the problem at hand.
b. Applies metacognitive skills during problem-solving, including the ability to assess process and progress, determine when stuck, and identify appropriate strategies to make progress.
c. Employs search strategies to obtain information needed to solve the problem at hand.
d. Accesses information from multiple information sources.
e. Demonstrates ability to assess the credibility and applicability of information sources.
f. Demonstrates ability to use information and apply knowledge to solve the problem at hand.
g. Integrates new knowledge and discoveries into what is already known.

For undergraduate programs, provide the department's plan for assessing student learning outcomes. Describe briefly how information on student learning will be collected and incorporated into existing processes for evaluating student learning in the department. Please attach the plan and a curriculum matrix.

The School of EECS and SEAS have a robust program assessment and continuous improvement plan as part of professional accreditation of their existing undergraduate programs. Program assessment is based on a rich set of evaluation data:

- *Samples of student work* collected in strategically targeted lower- and upper-division courses.
- *Professional skills discussions* in which student teams in CptS/EE 302, our required ethics and professional skills course, consider a complex, real-world engineering scenario.
- *Senior Capstone Design Teamwork Surveys* that have members of senior design teams self-assess their and their teammates' attainment of learning Outcome 5.
- *Senior Exit Surveys* completed by graduating seniors in our degree programs (completion of these surveys is a requirement for graduation).
- *Junior Writing Portfolio* which is a diagnostic assessment of students' writing skills administered by the WSU Writing Center.
- *Executive Council Discussions* in which the Assessment Committee Chair (or School Director) presents our Program Educational Objectives and recent assessment results for feedback and discussion.
- *Faculty Retreat Discussions* in which the Assessment Committee Chair is responsible for presenting recent assessment results and program issues for feedback, discussion, and action.

Details of the assessment and continuous improvement plan are described in the attached Assessment Manuals for the School of EECS (Pullman, Everett), and SEAS (Tri-Cities). The BSCyber degree program assessment will follow the same plan. Specific courses and student work samples for BSCyber program assessment will be decided by the program faculty.

Please indicate as appropriate:

☒ Assessment of this program will be incorporated into the existing assessment plan for School of Electrical Engineering and Computer Science (Pullman and Everett) and School of Engineering and Applied Sciences (Tri-Cities). Please attach a copy of the existing plan.

☐ A draft assessment plan is attached.

☐ A curriculum matrix is attached.

Planning:

Describe plans and include descriptions which provide evidence of:
1. The need for the change

Demand for cybersecurity experts globally is at an all-time high. Washington state industries are making significant investments in the education and training of cybersecurity professionals. The demand for cybersecurity professionals is expected to continue to grow for the foreseeable future. Cybersecurity industry growth has been consistently outpacing increases in new information security professionals. This has resulted in an imbalance between the supply of qualified job applicants and the demand from new job openings. Even though Washington is home to the highest workforce concentration of STEM professionals in the country, it also has a deficit of cybersecurity professionals. According to the cybersecurity supply/demand heat map (https://www.cyberseek.org/heatmap.html) available cybersecurity workers in the state of Washington is low relative to employer demand. Employer demand in cybersecurity professionals is expected to continue to grow in near future. The BSCyber program has been fully funded by the state of Washington in FY 2023 after review by the legislature and Governor's office.

2. The student population to be served
Provide realistic justification for the projected FTE.
How can transfer students articulate smoothly into the program and complete it with approximately the same number of total credits as students who enter WSU as freshmen?
Please describe specific efforts planned to recruit and retain students who are persons of color, disabled, or whose gender is underrepresented in this discipline.

We anticipate serving the following number of students once the program is fully implemented---about six years from the anticipated program start date of Fall 2023:
Pullman 150
Tri-Cities: 45
Everett: 30
The projected enrollment numbers are consistent with our experience with the offering of the BS in Software Engineering (BSSE) program in Pullman and Everett (starting Fall 2016). It is also consistent with the enrollment estimates and funding provided by the state.

The proposed BSCyber degree program is suitable for students transferring in either an Associate of Science Transfer (AST) or Direct Transfer Associate (DTA) Associate's degree. The lab science requirement for BSCyber has been carefully designed to facilitate transfer students completing an Associate's degree which satisfies WSU's lower division UCORE requirements. The lower division course requirements for the existing BSSE and BSCS degree programs and the proposed BSCyber degree program are designed to be similar to facilitate transfer students who may not be sure of what degree program to pursue at the beginning of their program in a community college. The School of EECS already offers a BS in Software Engineering degree program at Everett in a 2+2 model, where the students earn an associate's degree from a community college and complete the last two years at WSU Everett to earn their BSSE degree from WSU. Transfer students interested in the proposed BSCyber degree program could follow a similar path.

The BS in Computer Science (BSCS) and BS in Software Engineering programs have enjoyed consistent increase in enrollment over the last five years. The growth was observed even during the period 2020—2022, where university-wide enrollment numbers dropped due to the pandemic. The BSCS program has currently become the largest program in the Voiland College of Engineering and Architecture. Multiple factors have contributed to the high enrollment numbers in these programs, but one of the factors is the dedicated effort placed on recruitment and retention. The school of EECS has a committee of faculty representing the various degree programs that works closely with the VCEA undergraduate recruiting team to engage in various recruitment events on campus (including Experience WSU, Future Cougars of Distinction, National Merit Scholars, Future Cougars Friday). EECS academic showcase presentations at these events are typically well attended. We will leverage these positive experiences and platforms to promote the BSCyber program and recruit students.

The BS in Computer Science at Tri-Cities is consistently one of the top 5 programs in terms of academic interest for incoming freshmen. There have been approximately 10 full-time transfer students admitted to the program annually since 2016. Adding a BS in Cybersecurity will be attractive to other community college students who currently only have the BAS option for a career in Cybersecurity.

WSU Everett has offered EECS coursework since 2016 in a 2+2 configuration featuring upper-division coursework, many of which would also be crucial part of the newly proposed BS in Cybersecurity curriculum. Maintaining steady growth over the years, Everett has averaged 88 students per semester. Everett CC offers a certificate and 2-year program in Cybersecurity with the first graduates coming in Spring 23. We have been working closely to align the WSU coursework with the community college pathway for transfer students. With a smooth transfer pathway, we would leverage VCEA/EECS' presence in WSU Everett, utilizing the programs at Everett that aims at recruit and retain students from traditionally underrepresented groups, such as High School Girls STEM Field Trip, First Generation University Students Orientation Panel.

3. Procedures used in arriving at the decision to change (e.g., consultation with advisory boards, input from industry or employers, commissioned studies, faculty task force, etc.).

The BSCyber program has been funded by the state of Washington after review by the legislature and Governor's office.
The School of EECS, VCEA along with the WSU office of corporate engagement have established a strong network of industrial partners and advisors to ensure degree programs are meeting industry needs. This network includes the presence of many of the region's high-tech companies serving on one or more advisory boards (including Microsoft, Boeing, SEL, PNNL, Paccar, Google, Amazon, Nordstrom, Proof Point, and others). Currently over 95% of the computer science capstone design projects completed in the School are designed and sponsored by industrial partners. We will extend this culture to this new Cybersecurity degree program.

4. Organizational arrangements required within the institution to accommodate the change.

The BSCyber degree program offering will be supported by the existing administrative structure of the School of EECS and SEAS in the VCEA. We do not anticipate additional organizational arrangements or changes for this program. Additional faculty and staff will be recruited as described elsewhere in this proposal.

5. Lay out a three-year timetable for implementation, including hiring plans, partnership contracts if needed, facilities modification, recruiting, and other elements of implementation. Provide dates for each step.

The Voiland College of Engineering and Architecture (VCEA) has started the search process for hiring up to nine faculty in Cybersecurity across Pullman, Everett, and Tri-Cities. Link for faculty hire:
Pullman: https://wd5.myworkday.com/wsu/d/inst/15$158872/9925$10281.htmld
Tri-Cities: https://wd5.myworkday.com/wsu/d/inst/15$158872/9925$10297.htmld
Everett: https://wd5.myworkday.com/wsu/d/inst/15$158872/9925$10283.htmld

It is a combined search process with the search committee comprising faculty from all three locations and candidates having the option of choosing the campus(es) that best suit their background and career plan. In addition, we plan to

add three staff positions (e.g., academic coordinator) to support the BSCyber program. We anticipate completing most of the hiring in FY 2023.

The faculty curriculum committee for the proposed BSCyber degree program has developed the four-year degree plan. In addition to existing courses, it will include six new courses---two required courses and four elective courses. Syllabi for all courses have been developed and are under review by the Faculty Senate committees. Development of detailed course material will be done over the next two academic years (2022-23 and 2023-24). First the required courses will be developed followed by elective courses.

The faculty curriculum committee for the proposed BSCyber degree program has identified courses that will have hands-on exercises. They have also short-listed possible options for these exercises: self-built kits vs contracting with a third-party company. Once they study the options and their pros and cons, a recommendation will be made to the program administrators. We plan to procure necessary equipment and modification of existing computer lab space(s) in FY 2023.

Refinement of course material and hands-on exercises will be done in Year 3, following the first offering of a course. Data from course assessment will inform this process. Feedback from industry partners and advisors will also be sought as part of this process. Any leftover course development will also be completed in Year 3.

We will work with WSU admissions office, recruiters, Office of International Programs, as well as our community college partners to recruit students.

Everett will follow the same curricular plans for the BSCyber with a special focus on the 2+2 transfer model for our campus. Once the curriculum is approved, we will meet with each community college in the area to develop pathways for prospective students. Working with the community colleges for recruitment of transfer students along with our dual enrollment opportunities will bolster the recruitment efforts. Likewise, we will add emphasis toward recruiting Veteran's due to our proximity for several military installations in the Puget Sound area.

Budget:

☒ Attach the Financial Worksheet with five-year FTE, revenue and expenditure projections. Fully account for costs such as staff support, training, library, facilities and so on.

Please describe the funding picture narratively, including funding sources, department, college and/or campus commitments, investments already made, one-time costs, facilities costs (labs, classrooms, offices, telecom etc.) and library costs.
The state of Washington is fully funding the BSCyber degree program. The total dollars requested was $2,055,000 annually, with $922,000 to Pullman, $570,000 to Tri-Cities, and $563,000 to Everett. Budgetary details are included in the attached spreadsheet.

Student Services:

Describe the capacity of student support services to accommodate the change at this location. Include a description of admissions, financial aid, advising, library, tutoring and other services specific to this request.

With the new budgetary model to be implemented starting FY 2024, financial support from central administration for support units and services will be based on student enrollment. We anticipate this will provide adequate financial resources to student support services; the financial resources would increase in step with increased student enrollment in the BSCyber program.

WSU Tri-Cities has a learning commons where student support services are centralized and the cross-training and collaborative nature of these services enables capacity to add the projected number of new students in cybersecurity. The campus recently hired a full-time transfer advisor who is focused on increasing the number of low-income students in STEM transferring from the 6 community colleges in our region. We have a Bridges program with Columbia Basin College and Blue Mountain Community College where students receive support from both institutions to ease the transfer process.

The Everett campus provides comprehensive student services, often in collaboration with centralized units to ensure student success. Included as dedicated recruiters and advisors, career counseling, financial aid, tutoring, student involvement and tech support for all students. The Everett campus is also skilled in working with students to match their goals with the programs and services offered at WSU. Additionally, WSU Everett personnel are experts in adult and contemporary learning and provide specialized services to meet unique student needs. Everett creates meaningful student engagement through student involvement activities offered virtually and face-to-face. Our students will have access to the new Cascade Learning Commons built by EvCC and adjacent to our building. Everett students also receive a free city library card and have access to all WSU Library Services.

Describe the implications of the change for services to the rest of the student body.

We do not anticipate any change for services to the rest of the student body as a result of the proposed BSCyber program.

Physical Facilities and Equipment:

Outline the provision/s made for physical facilities and equipment at the proposed location that will support the program and its projected growth. Include videoconferencing and other technologies that support course delivery as well as classrooms, labs, and office space.

The faculty curriculum committee for the proposed BSCyber degree program has identified courses that will have hands-on exercises. They have also short-listed possible options for these exercises: self-built kits vs contracting with a third-party company. Once they study the options and their pros and cons, a recommendation will be made to the program administrators. The state of Washington has fully funded the BSCyber degree program starting FY 2023. We will be using part of the FY 2023 funds to procure necessary equipment and modification of existing computer lab space(s).

WSU Everett will build a secure server framework for use in teaching demonstration and lab work by students. We are repurposing one of our existing small computer labs to a lab space that will include all the recommended lab and software components noted by the curriculum committee. Everett Community College has an Industrial Cybersecurity lab that we can reserve as needed for special projects with students and collaborations between campuses.

WSU Tri-Cities and Everett have a robust and extensive videoconferencing system that is supported by three full-time staff. Office space for the three new faculty has been identified and will be adjacent to the cyber lab.

Library and Information Resources:

Using the Library Analysis form, describe the availability and adequacy of library and information resources for this degree, degree level, and location. Note plans to address gaps.
We do not anticipate the proposed BSCyber degree program to require additional library resources. Given the nature of Cybersecurity field, the majority, if not all, required library resources can be provided online from Pullman. We forecast that our students will not heavily utilize the services of the WSU System Libraries. As such, existing library collections, equipment, personnel, and services will be adequate for serving the proposed program's needs.

Faculty:

List the educational and professional qualifications of the faculty relative to their individual teaching assignments. List the anticipated sources or plans to secure qualified faculty and staff.
With existing faculty expertise in computer science, computer engineering, electrical engineering, and software engineering and adding new expertise in cybersecurity, the School of EECS and SEAS is well positioned to establish the BSCyber program and address one of the state's highest workforce needs. The Voiland College of Engineering and Architecture (VCEA) at Washington State University has already made a significant effort towards cyber security education by establishing the Northwest regional VICEROY Virtual Cyber Institute consortium – Cyber Security Education & Research (CySER) – to train a cybersecurity ROTC and DoD-skilled civilian workforce. CySER primarily focuses on bachelor's certifications. However, it can be used as a launch pad to offer the BSCyber degree program. New faculty expertise in cybersecurity and existing faculty expertise in complementary areas of Computer Science and Computer Engineering create a unique and advantageous opportunity for the School of EECS and SEAS to offer the new BSCyber program. The state of Washington has provided $2 million in funding for offering the BSCyber program. Searches for multiple faculty positions are currently underway at Pullman, Everett and Tri-Cities. We are conducting a joint search for all three locations to identify candidates based on applicant's interest in geographic location and academic needs of the particular campus.

Impact on Other Locations/Programs:

Briefly describe any impacts on other WSU programs and locations, and how you came to these conclusions (who was consulted?). If there are potential adverse impacts, describe how these will be addressed. Consider such things as: reallocation of faculty time, reallocation of AMS courses, impact of blended courses, internal competition, "cannibalization" of other programs, curricular effects for other degrees, effects on recruitment markets for other campuses. Indicate how such problems will be addressed for each campus or department affected.
We do not anticipate any adverse impact of the BSCyber program on other WSU programs. This program complements the existing programs in BSCS and BSSE. As sister disciplines, CS, SE and cybersecurity share the fundamentals of a computer science curriculum. Since the programs are/will be housed with the same administrative unit (School of EECS and SEAS) within VCEA, this would allow for streamlined course offerings for the three programs. Some courses (mainly at the lower-division) will be shared across the programs with specialized courses (mainly at the upper-division) that are either unique to the three programs (and may serve as optional elective for the

other program(s)). Enrollments in BSCS has continued to grow even after the introduction of the BSSE program in 2016. With the burgeoning demand for computer scientists (in a broad sense), we anticipate the three programs---BSCS, BSSE, BSCyber---to synergistically grow and offer more elective options to students in the three programs.

Sustainability

What are the plans for continuing the program past 5 years if the goals for enrollment are not met, or other circumstances prevent the execution of the plan described here?
We will engage with our industrial partners and advisors to ensure degree programs are meeting industry needs. This network includes the presence of many of the region's high-tech companies serving on one or more advisory boards (including Microsoft, Boeing, SEL, PNNL, Paccar, Google, Amazon, Nordstrom, Proof Point, and others). We will work with the WSU admissions office and recruiters and the office of international programs to ensure we are reaching out to the largest set of potential students within the state as well as outside the state. We will leverage the synergy between course requirements for the existing BSCS, BSSE degree programs and the proposed BSCyber degree programs to ensure faculty and students have flexibility in terms of course offerings and electives. Should the goals for enrollment not be met at WSU Tri-Cities, we will engage our colleagues at Pacific Northwest National Laboratory to review recruitment and retention strategies and make recommendations for change. We will be diligent in our efforts to ensure we have scholarships and internship opportunities for all students in the program. If necessary, we will assign cyber faculty to teach courses required for the BS in computer science until we can bring enrollment levels up to our goals for cybersecurity. WSU Everett is working closely with Everett CC and other feeder community colleges where a cybersecurity certificate and/or Associates degree are offered to assure alignment and smooth pathway to upper-division coursework. This includes Dual Enrollment and financial aid consortium agreements. While we do not anticipate enrollment challenges for this degree we do have academic alternatives in Software Engineering and Data Analytics.

External Reviews

If this program is new to the Washington State University system, please provide the names and addresses of 2-3 external experts from similar institutions who could be contacted to provide reviews of this program.

Name	Contact Information (email, phone, address)

Attachments:

- ☒ Financial Worksheet
- ☒ Four-Year Degree Plan (undergraduate); curriculum overview (graduate and professional)
- ☒ Curriculum Map (undergraduate)
- ☒ Assessment Plan
- ☐ Letters of financial commitment
- ☐ Contracts or MOUs if applicable

Send in Word format to: provost.deg.changes@wsu.edu

Use Table 1 to report enrollment projections						
Students	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5***	**Year 6***
Headcount	50	125	155	185	215	225
AAFTE	50	125	155	185	215	225
Note on Year "N": Please replace the letter "N" with the year in which you expect the program to reach full enrollment.						
Use the FTE Calculator below to convert Headcount to Annual Average FTE for each year represented.						

FTE Calculator						
Credit Hours	Fall	Spring	Total			
Per Student	Headcount	Headcount	Headcount	otal Credits		
20			0	0		
19			0	0		
18			0	0		
17			0	0		
16			0	0		
15	125	125	250	3,750		
14			0	0		
13			0	0		
12			0	0		
11			0	0		
10			0	0		
9			0	0		
8			0	0		
7			0	0		
6			0	0		
5			0	0		
4			0	0		
3			0	0		
2			0	0		
Total	125	125	250	3,750		
Divide by 2 to get annual average				2		
Annual average credits				1875		
Divide by 15 for undergrads or 10 for grad students. Enter 15 or 10 >				15		
Annual average FTE				125		

Use Table 2 to report program costs and revenues

CS - Cybersecurity Degree - All Campuses

11/8/2022

		1st FTE	2nd FTE	Nth* FTE	1st Academic Year	2nd Academic Year	6th* Academic Year
Total Student HDC					50	125	225
Total Student AAFTE					50	125	225
					↑Enrollment values linked to Table 1↑		
Personnel							
Faculty		*↓Insert employee FTE by job title↓*			*↓Insert annual salaries by job title↓*		
Asst/Assoc or Full Professor - Pullman		3.00	3.00	3.00	417,000	417,000	417,000
Asst/Assoc or Full Professor - Everett		3.00	3.00	3.00	417,000	417,000	417,000
Asst/Assoc or Full Professor - Tri-Cities		3.00	3.00	3.00	417,000	417,000	417,000
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	9.00	9.00	9.00	1,251,000	1,251,000	1,251,000
Exempt							
Academic Coordinator		3.00	3.00	3.00	189,000	189,000	189,000
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	3.00	3.00	3.00	189,000	189,000	189,000
Classified							
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	0.00	0.00	0.00	-	-	-
Graduate							
Graduate Assistant		2.00	2.00	2.00	75,000	75,000	75,000
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	2.00	2.00	2.00	75,000	75,000	75,000
Total Personnel		14.00	14.00	14.00	1,515,000	1,515,000	1,515,000
Benefits					*↓Insert benefits based on current benefit rates↓*		
Faculty					384,000	384,000	384,000
Exempt					59,000	59,000	59,000
Classified					-	-	-
Graduate					57,000	57,000	57,000
Total Benefits					500,000	500,000	500,000
Link to current benefits model rates							
Goods and Services					27,000	27,000	27,000
Travel					-	-	-
Equipment (laptops, cameras, software)					14,000	14,000	14,000
Total Direct Costs					2,056,000	2,056,000	2,056,000
Total Indirect Costs	35%				1,107,077	1,107,077	1,107,077
Total Costs					**3,163,077**	**3,163,077**	**3,163,077**
One-Time Costs included in Row 45				*User inputs one-time costs →*			
Recurring Costs				*Formula calculates recurring costs→*	*3,163,077*	*3,163,077*	*3,163,077*
Total Costs					***3,163,077***	***3,163,077***	***3,163,077***
				Calculated total cost per student AAFTE:	**63,262**	**25,305**	**14,058**
				Calculated direct cost per student AAFTE:	**41,120**	**16,448**	**9,138**
Revenue							
Internal Departmental /Area Reallocation					-	-	-
Enrollment Funding (EBB/Graduate DDP)					-	-	-
New State Funds					-	-	-
WSU Allocation (Institutional reallocation)					-	-	-
Indirect Allocation (Central reallocation for support services)					1,107,077	1,107,077	1,107,077
Other <Proviso>					2,056,000	2,056,000	2,056,000
Total Revenue					**3,163,077**	**3,163,077**	**3,163,077**
					TRUE	TRUE	TRUE
					↑Total costs must equal total revenue↑		

**Note on Year "N": Please replace the letter "N" with the year in which you expect the program to reach full enrollment.*

Use Table 2 to report program costs and revenues

CS - Cybersecurity Degree - Pullman

11/8/2022

		FY24 1st FTE	FY25 2nd FTE	Nth* FTE	1st Academic Year	2nd Academic Year	6th* Academic Year
Total Student HDC					25	60	150
Total Student AAFTE					25	60	150
					↑Enrollment values linked to Table 1↑		
Personnel							
Faculty		*↓Insert employee FTE by job title↓*			*↓Insert annual salaries by job title↓*		
Asst/Assoc or Full Professor		3.00	3.00	3.00	417,000	417,000	417,000
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	3.00	3.00	3.00	417,000	417,000	417,000
Exempt							
Academic Coordinator		2.50	2.50	2.50	166,000	166,000	166,000
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	2.50	2.50	2.50	166,000	166,000	166,000
Classified							
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	0.00	0.00	0.00	-	-	-
Graduate							
Graduate Assistant		2.00	2.00	2.00	75,000	75,000	75,000
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	2.00	2.00	2.00	75,000	75,000	75,000
Total Personnel		7.50	7.50	7.50	658,000	658,000	658,000
Benefits					*↓Insert benefits based on current benefit rates↓*		
Faculty					128,000	128,000	128,000
Exempt					52,000	52,000	52,000
Classified					-	-	-
Graduate					57,000	57,000	57,000
Total Benefits					237,000	237,000	237,000
Link to current benefits model rates							
Goods and Services					14,000	14,000	14,000
Travel					-	-	-
Equipment (laptops, cameras, software)					14,000	14,000	14,000
Total Direct Costs					923,000	923,000	923,000
Total Indirect Costs	35%				497,000	497,000	497,000
Total Costs					**1,420,000**	**1,420,000**	**1,420,000**
One-Time Costs included in Row 45			*User inputs one-time costs →*				
Recurring Costs			*Formula calculates recurring costs→*		*1,420,000*	*1,420,000*	*1,420,000*
Total Costs					***1,420,000***	***1,420,000***	***1,420,000***
		Calculated total cost per student AAFTE:			**56,800**	**23,667**	**9,467**
		Calculated direct cost per student AAFTE:			**36,920**	**15,383**	**6,153**
Revenue							
Internal Departmental /Area Reallocation					-	-	-
Enrollment Funding (EBB/Graduate DDP)					-	-	-
New State Funds					-	-	-
WSU Allocation (Institutional reallocation)					-	-	-
Indirect Allocation (Central reallocation for support services)					497,000	497,000	497,000
Other <Proviso>					923,000	923,000	923,000
Total Revenue					**1,420,000**	**1,420,000**	**1,420,000**
					TRUE	TRUE	TRUE
					↑Total costs must equal total revenue↑		

**Note on Year "N": Please replace the letter "N" with the year in which you expect the program to reach full enrollment.*

Use Table 2 to report program costs and revenues

CS - Cybersecurity Degree - Everett

11/8/2022

		FY24 1st FTE	FY25 2nd FTE	Nth* FTE	1st Academic Year	2nd Academic Year	6th* Academic Year
Total Student HDC					10	25	30
Total Student AAFTE					10	25	30
					↑Enrollment values linked to Table 1↑		
Personnel							
Faculty		*↓Insert employee FTE by job title↓*			*↓Insert annual salaries by job title↓*		
Asst/Assoc or Full Professor		3.00	3.00	3.00	417,000	417,000	417,000
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	3.00	3.00	3.00	417,000	417,000	417,000
Exempt							
Academic Coordinator		0.20	0.20	0.20	9,000	9,000	9,000
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	0.20	0.20	0.20	9,000	9,000	9,000
Classified							
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	0.00	0.00	0.00	-	-	-
Graduate							
Graduate Assistant		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	0.00	0.00	0.00	-	-	-
Total Personnel		3.20	3.20	3.20	426,000	426,000	426,000
Benefits					*↓Insert benefits based on current benefit rates↓*		
Faculty					128,000	128,000	128,000
Exempt					3,000	3,000	3,000
Classified					-	-	-
Graduate					-	-	-
Total Benefits					131,000	131,000	131,000
Link to current benefits model rates							
Goods and Services					6,000	6,000	6,000
Travel					-	-	-
Equipment (laptops, cameras, software)					-	-	-
Total Direct Costs					563,000	563,000	563,000
Total Indirect Costs	35%				303,154	303,154	303,154
Total Costs					**866,154**	**866,154**	**866,154**
One-Time Costs included in Row 45			*User inputs one-time costs →*				
Recurring Costs			*Formula calculates recurring costs→*		*866,154*	*866,154*	*866,154*
Total Costs					***866,154***	***866,154***	***866,154***
		Calculated total cost per student AAFTE:			**86,615**	**34,646**	**28,872**
		Calculated direct cost per student AAFTE:			**56,300**	**22,520**	**18,767**
Revenue							
Internal Departmental /Area Reallocation					-	-	-
Enrollment Funding (EBB/Graduate DDP)					-	-	-
New State Funds					-	-	-
WSU Allocation (Institutional reallocation)					-	-	-
Indirect Allocation (Central reallocation for support services)					303,154	303,154	303,154
Other <Proviso>					563,000	563,000	563,000
Total Revenue					**866,154**	**866,154**	**866,154**
					TRUE	TRUE	TRUE
					↑Total costs must equal total revenue↑		

**Note on Year "N": Please replace the letter "N" with the year in which you expect the program to reach full enrollment.*

Use Table 2 to report program costs and revenues

CS - Cybersecurity Degree - Tri-Cities

11/8/2022

		FY24 1st FTE	FY25 2nd FTE	Nth* FTE	1st Academic Year	2nd Academic Year	6th* Academic Year
Total Student HDC					15	40	45
Total Student AAFTE					15	40	45
					↑Enrollment values linked to Table 1↑		
Personnel							
Faculty		*↓Insert employee FTE by job title↓*			*↓Insert annual salaries by job title↓*		
Asst/Assoc or Full Professor		3.00	3.00	3.00	417,000	417,000	417,000
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	3.00	3.00	3.00	417,000	417,000	417,000
Exempt							
Academic Coordinator		0.30	0.30	0.30	14,000	14,000	14,000
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	0.30	0.30	0.30	14,000	14,000	14,000
Classified							
<Insert Job Title>		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	0.00	0.00	0.00	-	-	-
Graduate							
Graduate Assistant		0.00	0.00	0.00	-	-	-
<Insert Job Title>		0.00	0.00	0.00	-	-	-
	Subtotal	0.00	0.00	0.00	-	-	-
Total Personnel		3.30	3.30	3.30	431,000	431,000	431,000
Benefits					*↓Insert benefits based on current benefit rates↓*		
Faculty					128,000	128,000	128,000
Exempt					4,000	4,000	4,000
Classified					-	-	-
Graduate					-	-	-
Total Benefits					132,000	132,000	132,000
Link to current benefits model rates							
Goods and Services					7,000	7,000	7,000
Travel					-	-	-
Equipment (laptops, cameras, software)					-	-	-
Total Direct Costs					570,000	570,000	570,000
Total Indirect Costs	35%				306,923	306,923	306,923
Total Costs					**876,923**	**876,923**	**876,923**
One-Time Costs included in Row 45			*User inputs one-time costs →*				
Recurring Costs			*Formula calculates recurring costs→*		*876,923*	*876,923*	*876,923*
Total Costs					***876,923***	***876,923***	***876,923***
		Calculated total cost per student AAFTE:			**58,462**	**21,923**	**19,487**
		Calculated direct cost per student AAFTE:			**38,000**	**14,250**	**12,667**
Revenue							
Internal Departmental /Area Reallocation					-	-	-
Enrollment Funding (EBB/Graduate DDP)					-	-	-
New State Funds					-	-	-
WSU Allocation (Institutional reallocation)					-	-	-
Indirect Allocation (Central reallocation for support services)					306,923	306,923	306,923
Other <Proviso>					570,000	570,000	570,000
Total Revenue					**876,923**	**876,923**	**876,923**
					TRUE	TRUE	TRUE
					↑Total costs must equal total revenue↑		

**Note on Year "N": Please replace the letter "N" with the year in which you expect the program to reach full enrollment.*

DEMAND ANALYSIS TO ACCOMPANY NOTICE OF INTENT FOR NEW OR EXTENDED DEGREES

The information from this form will be used:

- In summary form in the Notice of Intent
- In the Financial Analysis spreadsheet
- In the New Degree Proposal form
- In the submission for accreditation to the Northwest Commission on Colleges and Universities after approval by the Board of Regents

Using the information you developed in the Demand Analysis Workbook, please complete the form below and submit with your Notice of Intent. You do not need to submit the Workbook itself.

Proposed Degree	**Bachelor of Science in Cybersecurity**	**Location:**	**Pullman, Everett, Tri-Cities**

1. Employer Demand

If you are extending a degree, or have a related existing degree, briefly summarize the employment outcomes for your graduates.
What is the state and regional employment demand for this degree?
Is long-term employer demand expected to grow, remain stable, or decline?
What is your evidence?

Answer here:
Reference: Data from Bureau of Labor Statistics (BLS): https://www.bls.gov/ The Occupational Outlook Handbook of BLS has a broad occupation group called "computer and information technology" for employment opportunities in the filed of computer and information technology related industry. Within this group, the occupation of "Information Security Analysts," encompasses jobs that plan and carry out security measures to protect an organization's computer networks and systems. The proposed BS in Cybersecurity degree program will prepare graduates for this occupation. The data below were extracted in September 2022 from the BLS link: https://www.bls.gov/ooh/computer-and-information-technology/information-security-analysts.htm **Employment of information security analysts is projected to grow 35 percent from 2021 to 2031**, much faster than the average for all occupations. For comparison, the projected growth rate for Computer occupations is 15% and that for All occupations (in the US economy) is 5%.

About 19,500 openings for information security analysts are projected each year, on average, over the decade. Many of those openings are expected to result from the need to replace workers who transfer to different occupations or exit the labor force, such as to retire.

The Information Security Analysts occupation also has high paying jobs. According to BLS data, the median annual wage for information security analysts was $102,600 in May 2021 (latest available). The lowest 10 percent earned less than $61,520, and the highest 10 percent earned more than $165,920. For comparison, the median wage for Computer occupations is $ 97,430 and for All occupations is $45,760.

The following table provides regional (WA state and its metro areas) salary information for Information Security Analyst occupation.

Washington Wages for: 15-1212.00 - Information Security Analysts
Source: Bureau of Labor Statistics 2021 wage data - https://www.bls.gov/oes/

Location	Annual Median (50%)
United States	$102,600
Washington	$127,370
Bremerton-Silverdale, WA	$89,240
Olympia-Tumwater, WA	$101,910
Portland-Vancouver-Hillsboro, OR-WA	$102,410
Seattle-Tacoma-Bellevue, WA	$128,370
Spokane-Spokane Valley, WA	$96,730

The following table provides regional (five WA metro areas) employment data for Information Security Analyst occupation. The location quotient in table below is the ratio of the area concentration of occupational employment to the national average concentration. A location quotient greater than one indicates the occupation has a higher share of employment than average, and a location quotient less than one indicates the occupation is less prevalent in the area than average. It is evident that jobs in the Information Security Analysts occupation has a high concentration in two of the largest WA metro areas (Seattle-Tacoma-Bellevue and Olympia-Tumwater)

Area Name	Employment	Employment per 1,000 jobs	Location Quotient	
Bremerton-Silverdale, WA(0014740)	50	0.607	0.54	
Olympia-Tumwater, WA(0036500)	170	1.488	1.33	
Portland-Vancouver-Hillsboro, OR-WA(0038900)	1010	0.898	0.80	
Seattle-Tacoma-Bellevue, WA(0042660)	3280	1.711	1.53	
Spokane-Spokane Valley, WA(0044060)	100	0.405	0.36	

Date extracted on :Sep 26, 2022

https://www.onetonline.org/link/localtraining/15-1212.00?st=WA (O*NET OnLine, linked by BLS)
O*NET OnLine lists the outlook for the Information Security Analysts as "Bright Outlook": occupations are expected to grow rapidly in the next several years, will have large numbers of job openings, or are new and emerging occupations. Specifically, "Information Security Analysts" is listed as a Rapid Growth occupation and "Information Security Engineers" is listed as a New and Emerging occupation. **Most of the jobs in the Information Security Analysts occupation group "require a four-year bachelor's degree, but some do not**" (https://www.onetonline.org/link/details/15-1212.00).

2. Competitors

Who are your competitors? What is their competitive advantage? Are competitor-institutions planning to introduce similar programs/expand existing ones? Why is your department/school able to provide the proposed new degree better than other WSU departments/schools or other universities?

Answer here:

Source: https://www.onetonline.org/link/localtraining/15-1212.00?st=WA
(O*NET OnLine, linked by BLS. Training programs in WA state for Information Security Analysts occupation)

While there are many academic institutions offering Associate's, Bachelor's, Master's, and Doctor's degree programs broadly in Computer Science and Information Technology, there are relatively few programs in the area of Cyber/Information Systems Security.

WA institutions offering Bachelor's or Master's degree in Cybersecurity. Shown in parenthesis are degrees granted between July 1, 2020 and June 30, 2021.

1. City University of Seattle, BS in Cybersecurity (4 BS and 7 MS graduates)
2. University of Washington-Bothell, MS in Cybersecurity Engineering (5 MS graduates)
3. Western Washington University (WWU), BS in Cybersecurity (18 BS graduates)
   Joint academic program between WWU and Washington State community colleges; a "2+2" program, where students earn a specific cybersecurity transfer degree from a partner community college and complete the last two years at WWU to earn their BS in Cybersecurity from WWU.
4. Clark College, Bachelor of Applied Science degree in Cybersecurity (0 BAS graduates).

About 13 WA community colleges offer either a certificate program or an Associate's degree, broadly in the area of Computer and Information Systems Security/Auditing/Information Assurance.

In addition, the University of Idaho offers a BS in Cybersecurity and MS in Cybersecurity programs.

In particular, there is no research University in the state of Washington offering a comprehensive Bachelor's degree program in Cybersecurity.

3. Student Demand

Describe the target market in light of regional population trends, especially in the target age group.
What is the current number of students in existing programs in the proposed market area in this field? What is the potential number of students forecasted?
What are the key characteristics of the market segment you seek? How will your degree serve their needs?

Answer here:
The proposed new Bachelor of Science in Cybersecurity (BSCyber) degree program aims to meet burgeoning demand for computer scientists with expertise in cybersecurity. In addition to learning in traditional computer science courses, students will take classes and learn crosscutting concepts and skills in confidentiality, integrity, privacy, risk, adversarial thinking. The curriculum will include topics on security related to data, software, connection, cyber systems, and cybersecurity threats impacting organizations and society. The proposed BSCyber program will be complementary to the existing BS in Computer Science (BSCS) and BS in Software Engineering (BSSE) programs at WSU. As sister disciplines, computer science (CS), software engineering (SE), and cybersecurity share the fundamentals of a computer science curriculum. Where they differ is in advanced courses—CS focuses on topics in machine learning, data science, algorithm design, distributed and networked systems, human computer interfacing, pervasive computing, bioinformatics, and other topics of interest to the students. SE focuses on advanced courses in software design and development, software testing and validation, software maintenance, software security, and software management and integration. Cybersecurity focuses on security related to data, software, connection, cyber systems, and cybersecurity threats impacting organizations and society. Graduates in all three disciplines are in high demand among Washington state's computing and information technology (IT) industries. In addition to computer systems design and related services, cybersecurity professionals play fundamental and supporting roles in finance and insurance, management of corporate enterprise systems, and in administrative and support services for various industries. Cyberattacks have grown in frequency, and these analysts will be needed to create innovative solutions to prevent hackers from stealing critical information or creating problems for computer networks. Strong growth in digital health services and telehealth will also increase data security risks for healthcare providers. More of these analysts are likely to be needed to

safeguard patients' personal information and data. Recent shift to remote work and the rise of e-commerce have increased the need for enhanced security.

The BSCyber degree program would train students to design and build secure information networks, security tools such as firewalls, and secure methods of transporting data. Students will also develop skills in stress testing employers' security systems. It would thus attract students with interest in a variety of industries including information technology, finance, health, manufacturing, transportation, electric power grid.

Expected FTE					
Year 1	50	**Year 2**	125	**Year 3**	155

How did you arrive at these numbers? How do they compare with your current enrollments in an existing degree or option, or related degree?

Answer here:

We expect the initial enrollment in the program, across the three locations to be around 50 students in Fall 2023 (Year 1); Pullman 25, Everett 10, Tri-Cities 15. We expect this to ramp up to 125 and 155 students in years 2 and 3 respectively. At steady-state (anticipated in year 6), we expect a total enrollment of around 225 students; Pullman 150, Everett 30, Tri-Cities 45.

The enrollment projections are consistent with our experience based on the recent (Fall 2016) introduction of the BS in Software engineering (BSSE) degree program in Pullman and Everett. For comparison, the BSSE degree program started with an initial enrollment of 2 students in Fall 2016, followed by 33 students in Fall 2107 (Pullman and Everett combined; BSSE degree program is not offered in Tri-Cities). The Fall 2022 enrollment in BSSE is as follows: Pullman 71, Everett 50. The Fall 2022 enrollment in Computer Science (BA and BS combined) degree program is as follows: Pullman 830, Tri-Cities 88; Computer science degree program is not offered in Everett.

The WA state legislature is fully funding this degree as described in the proposal. The projected enrollment numbers for BS in Cybersecurity degree program above are also consistent with the forecast by Legislative Affairs and review by the Governor's office.

4. Recruitment Plan

How and where are students going to find out about this program? Who will represent this department in its promotion activities? What specific venues can you use to promote an awareness of this new program? What means will be used to access and educate businesses, industry, agencies, and/or institutions about this offering?

Answer here:

The BS in Computer Science (BSCS) and BS in Software Engineering programs have enjoyed consistent increase in enrollment over the last five years. The growth was observed even during the period 2020—2022, where university-wide enrollment numbers dropped due to the pandemic. The BSCS program has currently become the largest program in the Voiland College of Engineering and Architecture. Multiple factors have contributed to the high enrollment numbers in these programs, but one of the factors is the dedicated effort placed on recruitment and retention. The school of EECS has a committee of faculty representing the various degree programs that works closely with the VCEA undergraduate recruiting team to engage in various recruitment events on campus (including Experience WSU, Future Cougars of Distinction, National Merit Scholars, Future Cougars Friday). EECS academic showcase presentations at these events are typically well attended. We will leverage these positive experiences and platforms to promote the BSCyber program and recruit students.

In developing the curriculum, we have been engaging with several industry partners to solicit early feedback and input on our plans. Most of these interactions were initiated or facilitated by the WSU Office of Corporate Engagement. The purpose of these interactions is not only to obtain input and feedback to help create the program, but also to establish strong long-term ties in terms of supporting the program once it is established (e.g. via sponsoring of capstone projects, providing internships, and hiring of graduates). To give examples of recent interactions, we had fruitful conversations with cybersecurity experts and executives at Deloitte, Infosys, Boeing, and F5 Networks. All these partners were given the opportunity to comment on our proposed 4-year degree plan and draft of course syllabi. The feedback we obtained has been positive and has reassured us that we are on a track well-aligned with industry expectations and values. We also received a general sense of excitement about the program and sense of support.

School of Electrical Engineering and Computer Science
Assessment Manual for CptS, EE, CptE, and SE Degree Programs

Version 8
Last Modified 14 March, 2022

Revision History

Version	Description of Changes and the Rationale Behind Them
1 (12/26/13)	• Created initial manual per EECS AC meeting and 12/19 meeting with Behrooz and John.
2 (1/22/14)	• First complete draft of manual, based on further discussions with Behrooz and John.
3 (1/26/14)	• "Final" first draft based on input from John, Behrooz, Siva, and Jose.
4 (2/11/14)	• Timeline updated based on meeting with Behrooz, Siva, and Jose.
5 (3/7/14)	• Minor edits made to fix typos, and to bring timeline into correspondence with narrative.
7 (5/22/15)	• Updated Outcome H to new "Information Literacy" outcome, per Assessment Committee decision.
8 (6/08/15)	• Updated Table 3 (a) to remove outcome G from assessment in CptS 322, per discussion with instructor, and (b) to include CptS 423 as part of the B.A. assessment, since it is now a required part of the curriculum. Updated Figure 6 to establish 2.5 as the minimum acceptable level of performance, based on Assessment Committee discussion on May, 2015. We decided there was too much noise in the data to insist on 3.0 being the minimum acceptable level of performance; relaxing the minimum acceptable level of performance to 2.5 seemed more realistic. • Added a note to indicate that data on student job seeking and job placement will be furnished by the Associate Director of EECS, who will clean the data by filtering out survey duplicates and also those students who did not actually graduate.
9 (5/11/2018)	• Updated process for assessing student work samples to include mandatory meeting between Assessment Chair and course instructors prior to academic year in which work samples are to be collected. This is to ensure that a set of deliverables/questions can be tailored so as to facilitate assessment against targeted learning outcomes and performance indicators.
10 (6/5/2018)	• Added new section entitled "Student Learning Outcomes and Performance Indicators as an introductory (unnumbered) section of the manual. • Updated Student Learning Outcomes to align with the new CAC version 2 criteria. • Revised associated performance indicators to operationalize new SLOs. • Mapped new SLOs to courses targeted for assessment. • Revised assessment plan for teaching excellence per meeting with Partha, Siva, Jose, and Tom Fischer on 6/14/18.
U1 (4/6/2019)	• Unified assessment manuals for CptS, EE, CptE and SE degree programs for simplicity. Based on 4/6/2019 discussion with EECS Assessment Committee, we are unifying the process for assessing work in our capstone senior design courses. This unification, coupled with our unified process for assessing professional skills discussions and student work in the CptS/EE 302 course, means that nearly all of our assessment processes across degree programs are the same. It thus is simpler to maintain a single manual for all degree programs. • Removed Outcome 5 (Teamwork) as an outcome targeted for assessment in CptS/EE 302. There's no easy way to do it in 302 besides administering a teamwork survey, which we already do in the senior design course. • Removed Outcome 4 (Ethics) as an outcome targeted for assessment in CptS 423. There's no clear way to assess this outcome through the 423 final reports at this time. However, the outcome is still targeted for assessment in EE 416, whose final reports include a section on ethical considerations.
U2 (6/13/19)	• Updated Figure 1 and Table 3 to include Senior Design Exit Survey, which hadn't been properly documented in previous versions of the manual. • Improved manual prose based on edits made in 2019 self-study reports. • Included methodology for collecting and assessing senior design teamwork survey.
U3 (10/14/19)	• Updated manual in response to issues raised in 2019 ABET accreditation visit. Made checking the ABET website for updates in curricular and other requirements a part of our continuous improvement process. Tweaked procedure for sampling student work for assessment in targeted courses to eliminate potential instructor bias and improve randomness and representativeness.
U4 (6/5/20)	• Updated assessment process descriptions and flowcharts to reflect a completely online and mostly asynchronous assessment process, which we decided to adopt in 2020 after a positive experience with it during the Covid-19 pandemic. • Removed references to Teaching Excellence Report as a source of assessment data. We did away with these reports in 2019.

	• Updated several process descriptions that had become somewhat outdated, and expanded on some process descriptions that were vague. The manual should now provide more clarity on what we actually do. • Added Appendix B, which presents a sample grading rubric for the professional skills assessment. • Added Appendix C, which describes our EECS Assessment Archive.
U5 (1/5/21)	• JBS: Updated material concerning Professional Skills Assessment and CptS 302. SO 5 is no longer a targeted outcome for CptS 302 (this was noted 4/6/2019 but not actually removed). The Professional Skills discussion is collected "even years." The assessment of SOs 3 and 4 in EE 302 is done in "even years" and separate deliverables (other than the Professional Skills Discussion) are used for this assessment. • Added text to clarify what we mean by "odd" and "even" when it comes to academic years. • Various minor formatting and typographic tweaks were made throughout the document. • Added comment that SOs and SLOs are used synonymous. WSU prefers SLO while ABET prefers SO. • Added comment that links to ABET documents were the ones current at most recent site visit (they are no longer the most current documents). • Added text to footnote 3 stating that OSBLE is now a thing of the past and information about the new preferred software platform for the professional skills discussion will be added in the future. • Changed primary font to Times New Roman since previous font (LM Roman 10) is not available on Macs. • Added the Performance Indicators as a new Appendix B and changed the previous Appendices B and C to C and D, respectively. • Added information about the timing of the Junior Writing Portfolio. • Fixed table numbering (4 was labeled 5, 5 was 6, and 6 was 7).
U6 (2/20/21)	• JBS: Fixed number in Table 3. • Changed from "soft skills" to "professional skills."
U7 (8/18/21)	• JBS: Minor edits made to improve format consistency and to remove minor typos. • Tweaked wording regarding the material collected for assessment of senior design. • Removed "D" from Table 3 for SO 5 row and Professional Skills Discussion column. • Removed SO 5 from Professional Skills Discussion in Table 4 and Sec. 2.B. • Added a sentence specifying that ratings are done at quarter-point level of granularity. • Changed diamond 5 of Fig. 6 to read "at or above 2.5." • Modified description of SOs to clarify the use of "unified" SOs. • Removed mention of Teaching Excellence reports in Table 5.
V8 (3/14/2022)	• Replaced "U" in the manual version with "V" so that now "Vn" will be used for "version n." • Removed Chris Hundhausen and John Schneider's names at the top of the document. • Removed SO 1 from CptS 260 for SE as this was erroneous (i.e., it was not a targeted outcome for BSCS nor BACS so it should not be for an outcome for SE). Note that Appendix A claims the archive has assessment of SO 1 and 2 for CptS 260. I [JBS] cannot verify this but I removed mention of SO 1. • Changed wording at start of Sec. 2.C to make clear that the team-work survey is administered every other year. • SO 6 was missing from CptS 355 in Table 4. That was corrected. • CptS 350 (with SOs 1, 2, and 6) was missing in Table 4 for the BA in CptS. That was corrected.

Overview of this Manual

This manual describes the process by which the School of Electrical Engineering and Computer Science performs continuous improvement of its degree programs in computer science (CptS), computer engineering (CptE), electrical engineering (EE), and software engineering (SE). The manual is intended to serve as the authoritative guide to our continuous improvement process for those responsible for carrying it out. The manual is also intended to be a "living" document; we anticipate revisions to the document to occur regularly, and we will describe those revisions in the "Revision History" at the beginning of the document.

Student Learning Outcomes and Performance Indicators

The foundation of the continuous assessment process described in this manual is a set of *student learning outcomes* (SLOs). In this document student learning outcomes and *student outcomes* (SOs) will be used synonymously. Developed by the ABET Computing Accreditation Commission (CAC) and Engineering Accreditation Commission (EAC) for the accreditation of computing and engineering degree programs, these SLOs inform the choices we have made regarding both the data we collect and the specific assessments we

#	Description
1	Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
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.
3	Communicate effectively in a variety of professional contexts.
4	Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5	Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6	Apply computer science theory and software development fundamentals to produce computing-based solutions.
7	Acquire and apply new knowledge as needed, using appropriate learning strategies.

Table 1. Seven Student Learning Outcomes Used to Assess CptS Degree Programs

#	Description
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	An ability to communicate effectively with a range of audiences
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Table 2. Seven Student Learning Outcomes Used to Assess EE, CptE, and SE Degree Programs

perform using those data. The first six SOs in Tables 1 are mandated by ABET's "Criteria for Accrediting Computing Programs" (version 2.0). Table 2 presents the SOs mandated by ABET's "Criteria for Accrediting Engineering Programs" (2019 version). These were the SO requirements in effect at the time of the most recent ABET site visit. For our computing degree programs, we adopt a seventh SO, shown in Table 1, that we deem to be an essential capability of our graduates. Notably, this seventh SO aligns with the seventh SO in EECS's three engineering degree programs (EE, CE, SE), thus increasing the consistency of our assessment criteria across all of EECS's degree programs. In terms of communicating SOs to stakeholders, with this consistency established, we present a "unified" set of SOs that are provided in Appendix B.

To provide more specific criteria for assessing student performance, we have developed a set of *performance indicators* for each SLO. These performance indicators aim to operationalize each SO in more specific terms that can be readily used to assess student performance. We have created sets of performance indicators tailored to each degree program. However, these tailored sets of performance indicators are quite similar in their essence. This has enabled us to create a set of unified performance indicators that broadly apply to all degree programs. It is important to note that these are used only to describe our degree programs' performance indicators to a general EECS audience; they are not used as the basis for specific assessment activities.

Our degree program-specific and unified performance indicators can be found in the "SOs and Perf Indicators" folder of the EECS Assessment Archive, which is further described in Appendix A. Appendix B provides the SOs together with the unified performance indicators.

Continuous Improvement Process

Figure 1 presents a flowchart of our continuous improvement process. In this chart, inputs and outputs are denoted by parallelograms, processes are denoted by boxes, and decisions are denoted by diamonds. The personnel responsible for each element are shown in parentheses within the element; refer to the "Legend of Abbreviations" for descriptions of these personnel.

The process starts with an execution of our curricula (item 0 in Figure 1). The execution of the curriculum, combined with ancillary data collection activities, yields a rich set of evaluation data, as shown in the "input" parallelogram on the far left (item 1):

- *Samples of student work* collected in strategically targeted lower- and upper-division courses.
- *Professional skills discussions* in which student teams in CptS/EE 302, our required ethics and professional skills course, consider a complex, real-world engineering scenario.
- *Senior Design Teamwork Surveys* that have members of senior design teams self-assess their and their teammates' attainment of Outcome 5.
- *Senior Exit Surveys* completed by graduating seniors in our degree programs (completion of these surveys is a requirement for graduation).
- *Junior Writing Portfolio* which is a diagnostic assessment of students' writing skills administered by the WSU Writing Center.
- *Executive Council Discussions* in which the Assessment Committee Chair (or School Director) presents our Program Educational Objectives and recent assessment results for feedback and discussion.
- *Faculty Retreat Discussions* in which the Assessment Committee Chair is responsible for presenting recent assessment results and program issues for feedback, discussion, and action.

In May of each year, our Assessment Committee, with the assistance of the instructors of targeted courses and the faculty as a whole, analyze the assessment data (item 2). Discussions of the analysis results culminate in a set of recommendations, which are forwarded to each degree program's Curriculum Committee for further consideration. At the Committees' discretion, a given recommendation may or may not need faculty approval

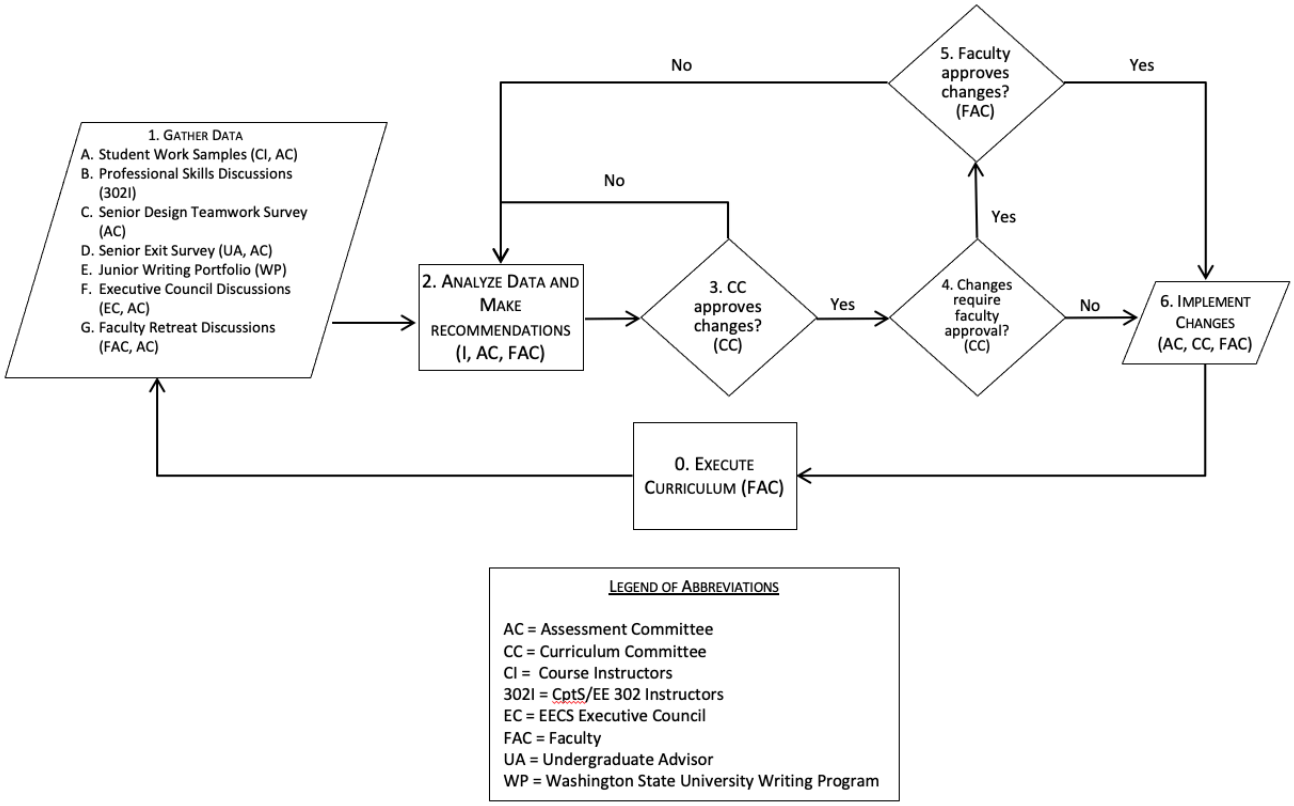


Figure 1. Flowchart of Continuous Improvement Process

(item 4). If it is determined that a given recommendation requires faculty approval, it is put to a faculty vote (item 5) and implemented if it passes. In contrast, if it is determined that a given recommendation does not require a faculty vote, the recommendation is implemented without a faculty vote. The implemented changes—the outputs of the continuous improvement process—are fed back into the execution of the curriculum. Thus, the feedback loop is closed, and the continuous assessment cycle starts another iteration.

ABET makes periodic changes to accreditation requirements. Such changes are typically promulgated through its website in August of each year. To ensure that our curricula and continuous improvement process are responsive to these changes, the Assessment Committee Chair and curriculum chairs of each degree program visit the ABET website each August. Any changes in our curricula or continuous improvement process needed to address evolving accreditation requirements are then flagged as issues for the next continuous improvement cycle.

1. Gather Data

Our program's improvement process considers seven different forms of data. Table 3 maps each of our program's outcomes to a relevant set of evaluation data and indicates whether the evaluation data directly or indirectly measure the outcomes. In the following subsections, we further document our methods for collecting each form of assessment data.

SO DESCRIPTION (UNIFIED FOR ALL DEGREE PROGRAMS)	TYPE OF ASSESSMENT DATA COLLECTED						
	Student Work Samples	Professional Skills Discussions	Senior Design Teamwork Surv.	Senior Exit Surveys	Junior Writing Portfolio	Executive Council Discussions	Faculty Retreat Discussions
1. An ability to identify, formulate, analyze and solve complex computing and engineering problems by applying principles of engineering, computing, science, mathematics, and other relevant disciplines.	D			I/S		S	S
2. An ability to design, implement and evaluate engineering and computing solutions that meet specified requirements with consideration of public health, safety, and welfare concerns, as well as global, cultural, social, environmental, and economic factors.	D			I/S		S	S
3. An ability to communicate effectively with a range of audiences in a variety of professional contexts.	D	D		I/S	D	S	S
4. An ability to recognize ethical and professional responsibilities in engineering and computing situations and make informed judgments based on legal and ethical principles, and with consideration of global, economic, environmental, and societal impacts.	D	D		I/S		S	S
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	D		I	I/S		S	S
6. An ability to apply appropriate computing and engineering approaches, theories, and fundamentals to conduct appropriate experimentation, analyze and interpret data, use engineering judgment to draw conclusions, and produce solutions.	D			I/S		S	S
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	D	D		I/S		S	S

Table 4. Mapping of Program Outcomes to Relevant Assessment Data Collected (D = Direct Measure, I = Indirect Measure, S = Supplemental Data)

A. Student Work Samples

Figure 2 presents a flowchart of the process by which we collect student work samples. Early in each academic year, the instructors of courses targeted for assessment, in consultation with the Assessment Committee Chair, complete an online survey[1] in which they formulate an assessment plan for their courses. That plan consists of (a) a set of performance indicators that are relevant to, and assessable within, the course; and (b) at least one course assignment problem or exam question that is specifically tailored both to assess

[1]The survey is currently maintained and administered through WSU's Qualtrics system. However, we have plans to build a custom web app to automate some of the more tedious aspects of the assessment plan. For further information, please contact Chris Hundhausen.

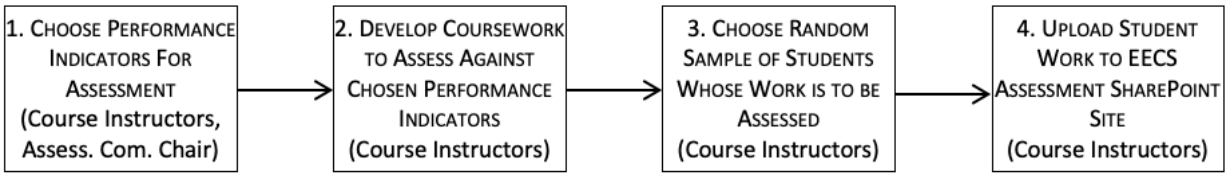


Figure 2. Flowchart of Process for Collecting Student Work Samples

each targeted performance indicator as directly as possible, and to lend itself to assessment by the Assessment Committee[2]; and (c) a list of students whose work is to be sampled.

Next, over the course of the semester, for each targeted deliverable, the course instructor collects the targeted student work of a random sample of either (a) 15% of the students enrolled in the course or (b) eight students in cases where a 15% sample is less than 8. The random sample is chosen as follows: Using a random number generator (such as that available at http://random.org), the instructor generates a random sequence of numbers between 1 and n, where n is the number of students enrolled in the course. The instructor chooses the first x random numbers in that sequence, $R_1 - R_x$, where x is the greater of (a) the ceiling of $n \times 0.15$ or (b) 8. In the class roster (where students are ordered alphabetically), the instructor selects students in roster positions R_1, R_2, … R_x to obtain the required random sample. When fewer than 8 samples are available, the instructor collects all available samples.

If, for a targeted deliverable, one or more of the students in the random sample did not hand in work, then the instructor selects alternative samples by (a) obtaining additional random numbers in the random number sequence previously generated and (b) selecting from the student roster the students in those positions.

Table 4 presents the courses we target for student work samples in our CptS, CptE/EE, and SE degree programs. As the table indicates, we collect student work samples on a two-year rotation that focuses on technical skills outcomes (1, 2, and 6) in odd years, and professional skills (sometimes referred to as "soft skills" outcomes (3, 4, 5, and 7) in even years. Note that for purposes of this manual, "odd years" and "even year" are based on the year in which an academic year starts. So, for example, academic year 2015-16 is termed odd while academic year 2016-17 is considered even. (This is somewhat in contrast to standard WSU nomenclature where "AY16," which is seemingly even, actually corresponds to the 2015-16 academic year.) Only required courses are targeted in order to ensure that we obtain student work from the broadest possible sample of students. In addition, we target courses at a variety of levels (200-, 300-, and 400-levels) in each degree program. However, owing to mismatches between required courses at each level and the targeted outcomes, this was not possible in all cases. As Figure 2 suggests, the choice of specific course deliverables to sample is left to the discretion of course instructors. However, in the case of our capstone senior design courses (CptS 423 for the CptS and SE degree programs; EE 416 for the CptE and EE degree programs), the work samples remain the same from year to year. Every year we assess the **final written reports** of student teams against the targeted outcomes for that year. In even years, we consider (a) student and instructor assessments of senior design team teamwork skills; and (b) assessments of the ability of senior design teams to communicate about their projects during the annual spring poster session.

[2]The exception is in the senior design courses (EE 416 and CptS 423), in which teams' final reports are always selected for assessment for the sake of continuity.

Degree Program	Odd Years (e.g., 2017-18) *Technical Skills* Outcomes Targeted (1, 2, 6)	Even Years (e.g., 2018-19) *Professional Skills* Outcomes Targeted (3, 4, 5, 7)
BS in CptS	CptS 260 "Computer Architecture" (2) CptS 350 "Algorithms" (1, 2, 6) CptS 355 "Programming Languages" (1, 2,6) CptS 423 "Senior Design Project II" (1, 2, 6)	CptS 302 "Professional Skills" (3, 4, 7) CptS 322 "Software Engineering" (7) CptS 423 "Senior Design Project II" (3, 5, 7)
BA in CptS	CptS 260 "Computer Architecture" (2) CptS 350 "Algorithms" (1, 2, 6) CptS 355 "Programming Languages" (1, 2, 6) CptS 423 "Senior Design Project II" (1, 2, 6)	CptS 302 "Professional Skills" (3, 4) CptS 322 "Software Engineering" (7) CptS 423 "Senior Design Project II" (3, 5, 7)
BS in CptE **BS in EE**	EE 214 "Design of Logic Circuits" (1, 2, 6) EE 321 "Electrical Circuits II" (1, 6) EE 416 "Senior Design II" (1, 2, 6)	EE 234 "Microprocessor Systems" (3) EE 302 "Professional Skills" (3, 4) EE 416 "Senior Design II" (3, 4, 5, 7)
BS in SE	CptS 260 "Computer Architecture" (2) CptS 350 "Algorithms" (1, 2, 6) CptS 423 "Senior Design Project II" (1, 2, 6) CptS 487 "Soft. Design and Arch." (1, 2, 6)	CptS 302 "Professional Skills" (3, 4) CptS 322 "Software Engineering" (7) CptS 423 "Senior Design II" (3, 5, 7)

Table 4. Two-Year Schedule for Collecting Student Work Samples

Finally, by the end of the semester in which student work is collected in a targeted course, the course instructor is required to upload the student work samples to the EECS Assessment SharePoint archive (https://emailwsu.sharepoint.com/sites/EECSAssessment). Appendix A presents the structure and organization of this archive. Instructors are required to upload student work files for their course to the <course num>/<assessment year>/Student Work Samples directory. For example, the CptS 260 instructor who collected work samples during the 2019-20 assessment cycle would upload student work files to the "CptS260/2019-20/Student Work Samples" folder.

Student work files must be uploaded in PDF format and must be named using the following convention:

`<CAMPUS>-<MAJOR>-<DELIVERALBE-NAME>-<SAMPLE#>.pdf`

where

`<CAMPUS>` is the WSU campus where the course was held (`PUL`, `EVE`, or `BRE`);

`<MAJOR>` is `BSCptS`, `BACptS`, `EE`, `CptE`, or `SE`;

`<DELIVERABLE-NAME>` is the name of the course deliverable; and

`<SAMPLE#>` is an integer between 1 and *n* where *n* is the number of random samples collected for that particular major in the course.

B. Professional Skills Discussions

Team discussions of a complex and realistic engineering scenario take place as the final exam in CptS/EE 302, our required course on ethics and professional skills. Figure 3 presents a flowchart of the process by which these discussions are collected. The first step is to create a prompt for a complex, real-world engineering scenario specifically designed to engage students in discussions in which they are to demonstrate evidence of their attainment of Outcomes 3, 4, and 7. In consultation with the Assessment Committee, the CptS/EE 302 course instructors on our three campuses collaboratively develop this prompt, thus ensuring that

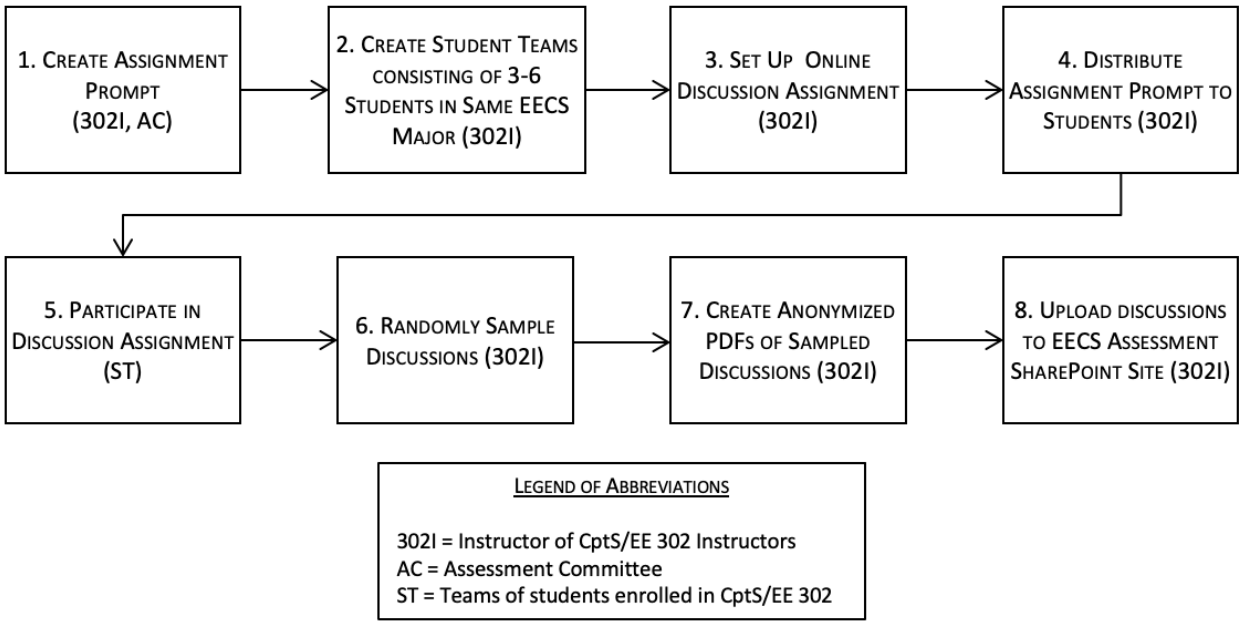


Figure 3. Flowchart of Process for Collecting Professional Skills Discussions

the same prompt is used across campuses (item labeled 1 of Figure 3). In Appendix C, we include a sample assignment prompt used in a past course offering.

In the second step (item 2), CptS/EE 302 course instructors select teams of students to participate in the discussions. Instructors may choose teams at their discretion, subject to two requirements: (a) to the extent possible, all members of a given team should be majors in the same EECS degree program and from the same campus; and (b) teams should consist of at least three and no more than six members.

Next, using the OSBLE Learning Management System (LMS) (https://plus.osble.org),[3] the course instructor sets up an assignment for the professional skills discussion activity (item 3). The team discussion assignment, which supports a separate private discussion area for each team with posts and one-level-deep replies, should be configured with the following settings:

1. Choose "Discussion Assignment" as the type of assignment.
2. Under "Assignment Components," choose "Instructor will use a grading rubric."
3. Under "Basic Settings," supply the prompt and designate a "Release Date" and "Due Date" that are roughly one week apart.
4. Under "Rubric," choose a previous version of the CptS/EE 302 course from which to load a rubric and then select a previous "Final Exam: Group Discussion Assignment" rubric to use. A sample rubric is included as Appendix D.
5. Under "Discussion Settings,"
    a. set the "Minimum length for first post (in words)" to 500;

[3]While OSBLE has been tailor-made to support professional skills discussions, alternative platforms may be used. An alternative platform must be able to meet the following requirements: (a) students may not see others' initial posts until they first make their own post (so that their initial ideas are not biased by other students' perspectives), (b) it must be possible to set a deadline for students' initial posts (so that discussions can move along according to the established schedule), and (c) it must be possible to export the final discussions to PDF such that student names are anonymized (to reduce bias when the Assessment Committee performs the assessments). In fact, OSBLE was not used for the fall 2020 discussions (Microsoft Teams was used) and it is not anticipated that OSBLE will be used moving forward. This section will be revised to reflect the preferred software platform once that has been established.

   b. leave "Maximum length for first post (in words)" at 0, indicating that there is no maximum length;
   c. check the box next to "Students must make initial post before they can view the posts of others" (this is important!); and
   d. set "Due date for initial post" to be two to three days after the assignment opens.
6. Under "Discussion Teams," divide students into teams of three to six students where each team should, to the extent possible, consist of students in the same EECS major and from the same campus (if the course is being delivered to multiple campuses). It may be helpful to name the teams according to major, e.g., "BS CptS 1," BS CptS 2," "BS EE 1," etc.

After the assignment prompt is distributed to students (item 4), students are typically given one week to complete their online discussion—the duration of the final exam period at WSU (item 5). Discussion milestones are established in the assignment prompt in order to help move the discussions along. After the assignment closes, the course instructor chooses a random sample of student discussions for assessment (item 6). The goal is to sample at least 15% of the students in each EECS major represented in the CptS/EE 302 class. (See the previous section titled "A. Student Work Samples" for the procedure to be used to obtain a random sample of students from a class.) If the 15% sample results in fewer than five teams for a given major, then the instructor should randomly select at least five teams for that major. If, in contrast, the 15% sample requires more teams than are available for a given major, then the instructor should select *all* teams represented by that major.

Finally, the instructor converts these discussions to PDF documents with student names anonymized (item 7) and uploads the documents to the EECS Assessment SharePoint site (item 7).

C. Senior Design Teamwork Survey

In our senior capstone design courses (CptS 423 and EE 416), teams of students work with a client or sponsor to develop a solution to address a real-world computing or engineering problem. Teams meet periodically with both the course instructor and with the sponsor/client to report on progress, obtain feedback and plan next steps. Because the project spans an academic year and requires extensive collaboration and coordination among team members, it provides a golden opportunity to assess students' attainment of SO 5, which relates to teamwork skills. Near the end of the semester, students are required to complete an online senior design teamwork survey[4] in which they rate themselves and their teammates with respect to four SO 5 performance indicators relevant to their project teamwork: c, e, f, and g.

Two weeks prior to the end of the spring semester, the Assessment Committee Chair sets up the online teamwork survey and shares the survey link with the senior design instructors, who distribute it to students and establish an end-of-semester deadline for completing the survey. Students are given course credit for completing the survey. When the survey deadline passes, the Assessment Committee Chair downloads the survey results for analysis.

D. Senior Exit Survey

As a requirement for graduation, seniors in our degree programs complete an online exit survey near the end of the semester in which they are to graduate. Figure 4 presents a flowchart of the process. Through an iterative process that considers the input of the assessment committee, executive council, and academic advisors, the specific questions and sequence of questions on the survey continuously evolve; the assessment committee reconsiders the survey design in the spring of each year (item 1 in Figure 4). The survey is administered online.[5] Our undergraduate academic advisors make the survey available to graduating seniors

[4]The survey is maintained and administered through WSU's Qualtrics survey system. To have the survey shared with you, please contact the Assessment Chair.

[5]The survey is maintained and administered through WSU's Qualtrics system. To have the survey shared with you, please contact Assessment Committee Chair.

during a three-week window near the end of each semester (items 2 and 3). After the survey closes each semester, the Assessment Committee Chair accesses the results and uploads them to the EECS Assessment SharePoint archive (item 5).

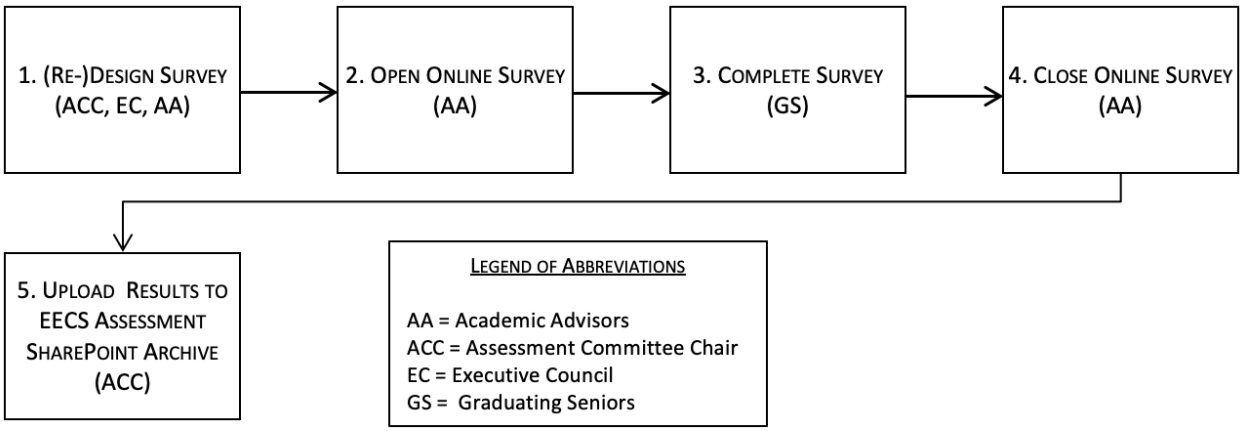


Figure 4. Flowchart of Process for Collecting Senior Exit Survey Data

The survey includes questions that ask students to self-rate their attainment of our Student Outcomes, thus providing an indirect measure of outcome attainment. In addition, the survey typically includes questions in four other general areas to provide further information for assessing our degree programs:

1. *Basic demographics*: How many students are graduating? What is the gender and ethnic composition of the graduating class? How did graduates come into the program (straight from high school, or as transfer students), and how long did it take them to graduate?
2. *Interdisciplinary, international, research, and internship experiences*: To what degree did graduates participate in interdisciplinary activities, international exchange programs, research activities, and internships?
3. *Job and graduate school success*: How many graduates sought employment or applied to graduate school? How successful were they? What are their starting salaries and who is hiring them?
4. *Level of preparation/training*: How prepared do graduates perceive themselves to be for careers in the profession and to what extent do students perceive themselves to have achieved the ABET outcomes?

E. Junior Writing Portfolio

The Junior Writing Portfolio, part of the WSU Writing Program, is a mid-career diagnostic assessment of all undergraduate students' writing prior to their enrollment in two upper-division Writing in the Major [M] courses, which instruct students in the written conventions of their chosen fields of study. In CptS and SE degree programs, there are three ("M") courses: the two required software engineering courses, CptS 322 and CptS 422, and the required professional skills course, CptS 302. In our electrical and computer engineering degree programs, there are two ("M") courses: EE 352, a required laboratory course, and EE 416, the required senior design course.

All WSU undergraduates include five samples of their written work in their Junior Writing Portfolios. Two of these samples come from a two-hour writing exercise that students must perform under closed conditions. They are assessed by a set of cross-disciplinary faculty raters who are recruited and trained as paid evaluators for the WSU Writing Assessment Program. The other three samples are drawn from students' college coursework. These three pieces of writing are re-evaluated for the Writing Portfolio by the original instructors of the courses as Acceptable or Outstanding.

The results of the Junior Writing Portfolio assessment are thoroughly documented in biennial reports issued by the University College Writing Program. These reports can be obtained on request by contacting the WSU Writing Program. The current point of contact for requesting the reports is Sharolon Carter (sharolon@wsu.edu). (The reports span a period from June of an odd year to May of the next odd year. The publication of the reports may be significantly after the close of the reporting period.)

F. Executive Council Discussions

The EECS Executive Council (EC) consists of the EECS Director and between one and two dozen representatives from industry. The EC is intended to give voice to the employers of graduates of the School of EECS. As such, council members are selected so as to be representative of the leadership of the largest employers of EECS graduates or representative of employers who may be considered aspirational for our graduates. One of the primary responsibilities of the EC is to provide industry perspective and feedback on the continuous evaluation of objectives and assessment of outcomes for the undergraduate curricula, and to suggest changes for implementation as needed. The EC meets with the School of EECS twice annually: once in the fall at a location convenient to EC members, and once in the spring in conjunction with the Senior Design Poster Session at the WSU Pullman Campus. During the spring meeting each year, the chair of the Assessment Committee of the School Director presents the previous year's assessment results to the EC and appoints a scribe to take detailed notes. Following the meeting, the scribe emails the notes to the Assessment Committee Chair, who uploads them to the EECS Assessment SharePoint archive.

G. Faculty Retreat Discussions

Prior to the start of the fall semester, we hold a one-day faculty retreat at which we present the previous year's assessment results and solicit input and suggestions from the faculty as a whole. In a morning presentation to the entire EECS faculty, the Assessment Committee Chair invites discussion on issues that transcend individual degree programs. In the afternoon, the CptS and SE faculty participate in a breakout session focused on CptS and SE-specific issues, while the CptE and EE faculty participate in a breakout session focused on CptE and EE-specific issues. Scribes are appointed to take detailed notes on all sessions. Following the retreat, the scribes email their session notes to the Assessment Committee Chair, who uploads them to the EECS Assessment SharePoint archive.

2. Assess Data and Make Recommendations

The previous section documented the processes by which we collect the different types of assessment data. In this section, we describe the processes by which we assess these data and make recommendations to be considered for implementation. To provide an overview of this process, Table 5 presents a timeline of when we perform each assessment activity.

A. Student Work Samples

Figure 5 presents a flowchart of the process by which we assess student work samples. Our assessment takes place through *a completely online and largely asynchronous process* involving members of the Assessment Committee and the instructors of the courses whose work has been targeted for assessment.

The process starts with the Assessment Committee Chair creating and configuring folders on the EECS SharePoint Site for each course to be assessed in the current assessment cycle, and then populating the corresponding folders with assessment content and/or double-checking the content that exists in the folders (items labeled 1–3 in Figure 5):

1. In the folder of each course targeted for assessment during the current cycle, create a subfolder with the assessment year (e.g., "2019-20").
2. Within that folder, create subfolders entitled "Assessment" and "Student Work Samples."
3. Within the "Assessment" folder, add a spreadsheet entitled `<course label>_AssessResults_<year>.xlsx`, where `<course label>` is, for example, "CptS_260" and `<year>` is the academic year of assessment, e.g., "2019-20".

a. In general, this spreadsheet should be created by copying a course assessment spreadsheet from 2019-20 or later.

ANALYSIS ACTIVITY	WHEN PERFORMED
A. **Assess student work samples**	Each May through online process; recommendations generated in June through online discussion and compiled in assessment report
B. **Assess professional skills discussions**	Each May through online process; recommendations generated in June through online discussion and compiled in assessment report
C. **Assess senior design teamwork survey**	Each May through online discussion; recommendations generated through online discussion and compiled in assessment report
D. **Assess senior exit surveys**	Each May through online discussion; recommendations generated through online discussion and compiled in assessment report
E. **Assess junior writing portfolios**	(Odd) Mays through online discussion; recommendations generated through online discussion and compiled in assessment report
F. **Assess Executive Council discussions**	Each May through online discussion; recommendations generated through online discussion and compiled in assessment report
G. **Assess faculty retreat discussions**	Each May through online discussion; recommendations generated through online discussion and compiled in assessment report

Table 5. Timeline of Assessment Activities

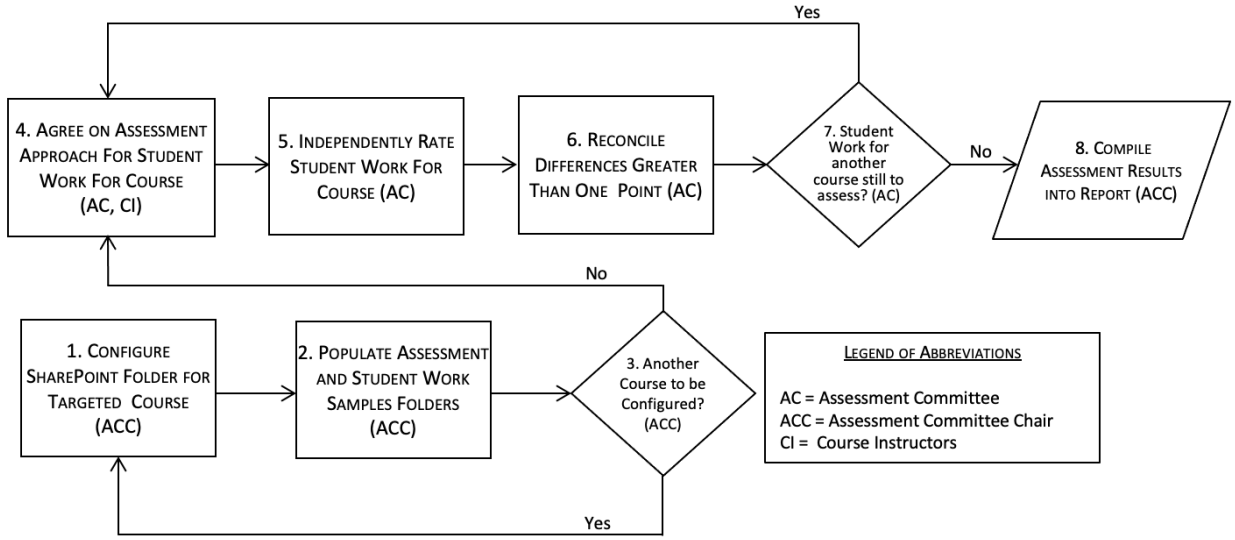


Figure 5. Flowchart of Process for Assessing Student Coursework

b. The spreadsheet should contain the following sheets (a.k.a. tabs):
   i. Two sheets labeled with the names of the two Assessment Committee members assigned to perform the course assessment. The contents of each sheet are identical; they include the following columns: "Campus," "Major," "Deliverable," "Subitem," "Sample," "SO," "Perf Ind," "Rating," and "Comments." The "Rating" and "Comments" columns are filled in by the raters as they perform their assessments; all other columns are pre-populated by the Assessment Committee Chair based on the deliverables, subitems, SOs and performance indicators flagged for assessment in the course assessment plan.
   ii. One sheet labeled "Totals" that auto-computes the average rating, difference, and reconciliation status of each item assessed.
   iii. One sheet labeled "Averages" that tabulates the average rating and average rater difference for each student outcome by campus and degree program. Note that the rows of the "Averages" sheet will be copied/pasted into a spreadsheet in the "Coursework Results" folder

that tabulates the coursework assessment results across all courses assessed for the current year.

4. Within the "Assessment" folder, add all of the assessment resources and instructions provided by the course instructor. These include solution keys, model solutions or assessment advice provided by the instructor as part of the course assessment plan. If possible, course instructors should be provided with the means to directly upload the samples of student work.
5. Within the "Student Work Samples" folder, ensure that there exists a student work file for each targeted deliverable and sampled student. (This is the folder into which course instructors uploaded student work.)

Once the Assessment Committee Chair has configured the SharePoint site for coursework assessment, two members of the Assessment Committee engage in the process of assessing student coursework for each targeted course (items 4–7 in Figure 5). First, in consultation with the course instructor, the two raters agree on an approach to assessing the student work from a given course. Note that, as mentioned in Sec. 1.A, a Qualtrics survey has been developed for the instructors of the targeted course to complete that is designed to facilitate identifying how and what material should be assessed. This survey should be used when possible to ensure a well-documented and agreed upon approach is available. Next, the two raters independently assess each work sample on a four-point scale (see Table 6) against the SOs and performance indicators indicated in the assessment plan. Raters are permitted to score at the quarter-point level of granularity (e.g., 2.0, 2.25, 2.5, and 2.75 are considered valid ratings but 2.2 and 2.6 are not). Finally, the two raters discuss and reconcile any disagreement of greater than one point, such that the disagreement is at most one point after the reconciliation. Each such reconciliation is logged in the spreadsheet, with raters noting their rationales for changing their ratings. In reports on the assessment ratings, the number of reconciliations, and average rater difference are included alongside the average ratings, in order to provide a measure of interrater reliability.

Finally, after all coursework is assessed, the Assessment Committee chair compiles the assessment results into a report, shares that report with the Assessment Committee online, and initiates an online discussion. Based on the discussion, the committee compiles a list of recommendations. The committee's recommendations are generally based on the average ratings of the student work, as illustrated by the flowchart presented in Figure 6. A rating of 2.0 or lower with respect to a given outcome provides strong

SCALE LEVEL	DEFINING CRITERIA
1. Unsatisfactory	• The student work contains a number of elements that are confusing, inconsistent, inaccurate, biased, unrealistic and/or or not credible. • The student work contains glaring gaps or no evidence in addressing a given performance indicator.
2. Needs Improvement	• The student work contains some elements that are confusing, inconsistent, inaccurate, biased, unrealistic and/or or not credible. • The student work contains evidence of a given performance indicator, but it is unclear to the evaluator the extent of student understanding.
3. Capable	• The student work contains most, but not all, of the following characteristics: realistic, relevant, accurate, consistent, unbiased and/or credible. • The student work addresses a given performance indicator in an obvious way.
4. Exemplary	• The student work is consistently realistic, relevant, accurate, unbiased and/or credible. • The student work goes beyond the obvious and thoroughly addresses a given performance indicator, possibly in a creative or nuanced way.

Table 6. Standard Scale Used to Assess Student Work

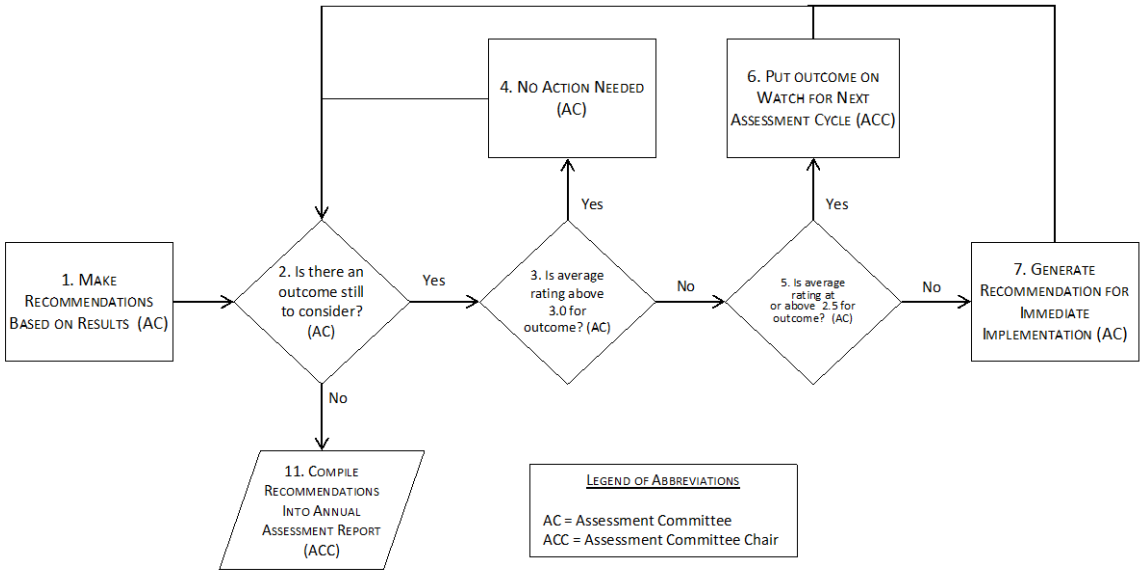


Figure 6. Flowchart of Process of Making Recommendations Based on Assessment Results

evidence that a change to the curriculum should be implemented as soon as possible. While not raising an immediate concern, a rating between 2.0 and 2.49 with respect to a given outcome puts us on alert to carefully monitor progress over the next assessment cycle. This may lead to a recommendation that extra assessment be performed with respect to that outcome, or it may lead to a recommendation to make (minor) changes to the curriculum or assessment process. Lastly, a rating of 2.5 or above with respect to a given outcome provides evidence that we are meeting our target level or performance, and hence that no changes are necessary.

B. Professional Skills Discussions

Figure 7 presents a flowchart of the process by which we assess the professional skills discussions collected each spring in our CptS/EE 302 course. In preparation for this assessment, the Assessment Committee Chair configures the folder on the EECS Assessment SharePoint site that will house the assessment materials (items labeled 1 and 2 in Figure 7).

Next, through online communication, the two members of the Assessment Committee who will be performing the assessments converge on an approach for assessing the discussions relative to the targeted SOs (3, 4, and 7). Because the discussion prompt requests students to structure their discussion into segments relevant to each SO, raters are generally able to focus on specific threads within the discussion to assess student performance relative to each SO. After this, the two raters assess each discussion. Each rating that differs by more than one point must be reconciled such that it differs by at most one point. Raters must document each such reconciliation, which, along with raters' average differences per rating, provide a sense of their interrater reliability in the final report.

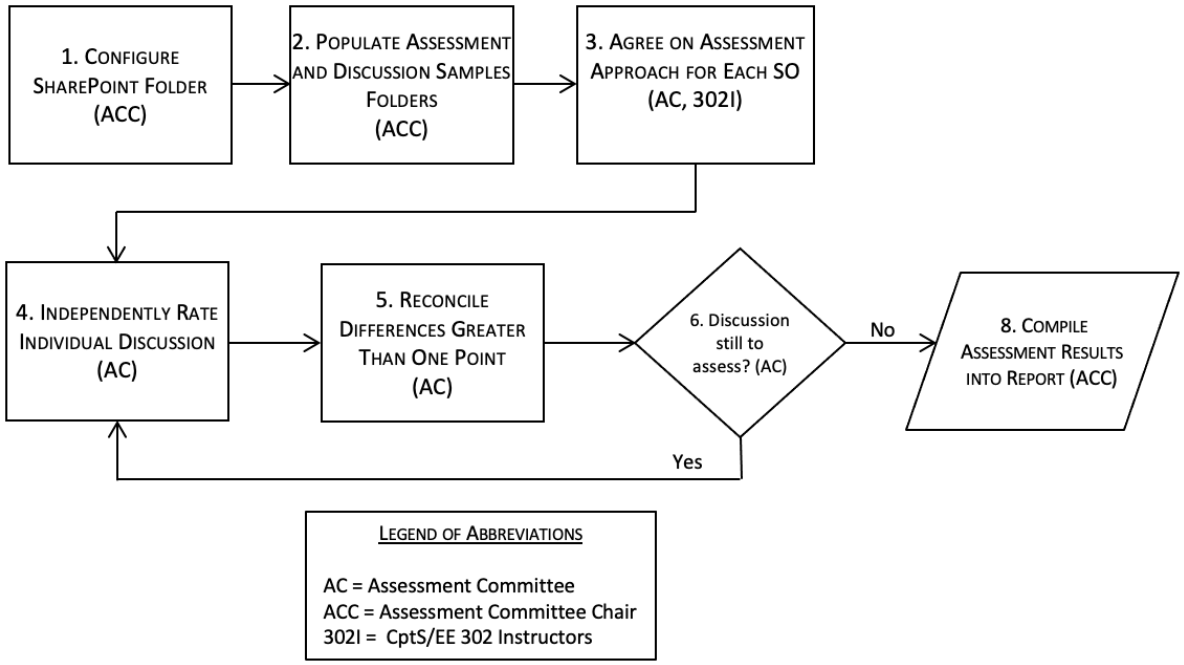


Figure 7. Flowchart Depicting Process of Assessing Professional Skills Discussions

Once all discussions have been assessed, the Assessment Committee Chair compiles the results of the assessment into a draft report, which is shared with the committee for feedback and discussion. Based on that feedback and discussion, the report and recommendations are updated. As with the assessment of student work samples (see previous section), the process depicted in Figure 6 is utilized to generate recommendations.

C. Senior Design Teamwork Survey

In May of odd years, the Assessment Committee Chair analyzes the responses to the Senior Design Teamwork Survey, compiling aggregate results of students' ratings of themselves and their teammates' attainment of SO 5 within their senior design team projects. These results and a set of recommendations are then integrated into a first draft of the annual assessment report. During a one-week review period, the Assessment Committee is invited to review and provide feedback on the draft report through an online discussion. The Committee's feedback is then incorporated into a final draft of the report.

Survey questions that prompt students regarding their and their teammates' attainment of our SOs use the same four-point scale used to evaluate student work (see Table 6). As with the assessment of student work samples (see Sec. 2.A), the process depicted in Figure 6 is utilized to generate recommendations.

D. Senior Exit Surveys

Each May, the Assessment Committee Chair writes a draft report summarizing the senior exit survey results and making recommendations based on those results. Recommendations are made based on the following targets:

- On 4-point Likert-style survey questions related to students' preparedness for future career endeavors, we aim for an average response of 2.5 or higher.
- On survey questions that have students use the 4-point assessment scale shown in Table 6 to self-rate their attainment of our Student Outcomes, we aim for an average response of 2.5 or higher.
- With respect to the data on job placement, our goal is that 75 percent of our graduating seniors either obtain a job in the field or are accepted into graduate school within one year of graduation. To determine whether we have met this goal, we administer two follow-up job placement surveys at

three months and one year after graduation. Data from these follow-up surveys are integrated into our annual reports as they become available.

The draft report is shared online with members of the Assessment Committee, who are invited to provide feedback and suggestions, which are then integrated into the final version of the report.

E. Junior Writing Portfolio

Every other May, the Assessment Committee Chair seeks to obtain the latest Junior Writing Portfolio results from the WSU Writing Program, and writes a draft report with results and recommendations. The Assessment Committee is invited to provide feedback and suggestions, which are then integrated into the final version of the report. We have established the following target level of performance for this data source: We want 80 percent or more of EECS majors to pass their Junior Writing Portfolio, with 10 percent of those students passing with distinction. If this target level is met in a given assessment cycle, we make no further recommendations. If this target level is not met, we may choose to make recommendations to address the concern, depending upon the extent to which the target level was missed.

F. Executive Council Discussions

Each May, the Assessment Committee chair compiles a draft report that summarizes the notes from the Executive Council discussion that took place the previous April and makes recommendations based on those notes. The draft report is shared online with members of the Assessment Committee, who are invited to provide feedback and suggestions that are integrated into the final version of the report.

G. Faculty Retreat Discussions

Each May, the Assessment Committee chair compiles a draft report that summarizes the notes from the Faculty Retreat discussion that took place the previous August and makes recommendations based on those notes. The draft report is shared online with members of the Assessment Committee, who are invited to provide feedback and suggestions that are integrated into the final version of the report.

3. Approve Recommendations

The flowchart presented in Figure 1 documents the process by which we decide whether to approve the recommendations that come out of the assessment process described in the previous section. At an annual meeting that takes place shortly after the faculty retreat, our Curriculum Committees consider each recommendation in turn. Using a ballot with the following three choices, the committees vote on whether to implement each recommendation:

1. Implement the recommendation without obtaining explicit faculty approval
2. Do not implement the recommendation
3. Implement the recommendation only if it gains faculty approval

If a majority of committee members choose (1) for a given recommendation, that recommendation is flagged for implementation in the upcoming assessment cycle. If a majority of committee members choose (2) for a given recommendation, that recommendation is not flagged for implementation. Finally, if a majority of committee members choose (3) for a given recommendation, that recommendation is passed along to the Director of EECS, who puts the item up for a faculty-wide vote at the next faculty meeting. If approved by the faculty, the recommendation is flagged for implementation in the next assessment cycle; otherwise it is not.

4. Implement Changes

Since each recommended change requires a different combination of personnel and resources to implement, it is impossible to document *a priori* a specific implementation process here. Rather, we simply note that the Curriculum Committee, in coordination with course instructors, academic advisors, and the Director of EECS,

is responsible for developing a concrete plan for implementing each approved recommendation. That plan is shared with collaborating parties through electronic correspondence and/or face-to-face meetings.

5. Summary Timeline

Table 7 presents a summary timeline of data collection and assessment activities (dates in the table are approximate). Our assessment cycle commences with the annual Faculty Retreat prior to the start of the fall semester in August, and ends with the sharing of recommendations from the annual assessment report with curriculum committees, the EECS Director, and any other relevant parties, who then decide how to act upon the recommendations, thus closing the loop on our continuous improvement process.

When	Activity Type	Description
Aug. 20	Data Collection	Assessment Committee Chair presents previous year's assessment results at annual faculty retreat for feedback and discussion; detailed notes on all discussions are taken
Sep. 15	Data Collection	Instructors of targeted fall courses submit course assessment plan through online survey
Dec. 15	Data Collection	Instructors of targeted fall courses upload student work samples to EECS Assessment SharePoint Site
Dec. 15	Data Collection	In even years, the CptS/EE 302 course instructors submits professional skills discussion transcripts from fall semester to Assessment Committee
Dec. 15	Data Collection	Graduating seniors in fall semester complete online senior exit survey (although survey may remain open through February to maximize completion as this is a graduation requirement)
Feb. 1	Data Collection	Instructors of targeted spring courses submit course assessment plan through online survey
Apr. 20	Assessment	In even years, Assessment Committee participates in senior design team poster session in order to assess senior design team posters (may be done at annual EECS Open House or virtually)
Apr. 20	Data Collection	Assessment Committee Chair presents assessment results to Executive Council for feedback and discussion
Apr. 20	Data Collection	In even years, students in senior design courses complete Senior Design Teamwork Survey
May 1	Data Collection	Assessment Committee Chair obtains Teaching Excellence Report from Teaching Excellence Committee Chair. NOTE: Teaching Excellence Reports have been discontinued.
May 1	Data Collection	Every other year, Assessment Committee Chair obtains Junior Writing Portfolio results for CS majors from WSU Writing Program (reports span two-year cycles running from June of an odd year to the May of the next odd year, e.g., June 2017 to May 2019, but when the report is actually published may vary, e.g., the report ending May 2019 was not published until May 2020)
May 10	Data Collection	Graduating seniors in spring semester complete online senior exit survey (although survey may remain open for additional months to maximize completion as this is a graduation requirement)
May 10	Data Collection	Instructors of targeted spring courses upload student work samples to EECS Assessment SharePoint Site
May 15	Assessment	Assessment Committee, with assistance from course instructors, assesses student work
May 15	Assessment	In even years, Assessment Committee, with assistance from the CptS/EE 302 instructor, assesses professional skills discussions
May 31	Documentation	Assessment Committee Chair completes first draft annual assessment report and shares with Assessment Committee for review and feedback online
June 15	Documentation	Assessment Committee Chair integrates Assessment Committee feedback into final draft of annual assessment report
June 15	Recommendation Implementation	Assessment Committee Chair shares any actionable recommendations from Annual Assessment Report with EE/CptE and CptS/SE Curriculum Committees, the EECS Director and/or other relevant parties. These parties decide how to act on the recommendations.

Table 7. Summary Timeline of Annual Assessment Process (dates are approximate)

Appendix A: EECS Assessment Archive

We maintain a comprehensive digital archive of all our assessment materials. This archive is stored on a password-protected SharePoint site, which can be, after authenticating with WSU credentials, accessed at:

https://emailwsu.sharepoint.com/sites/EECSAssessment

To better support the activities of the Assessment Committee, we created a Microsoft Teams site around this SharePoint archive in May, 2020. This prompted a reorganization of the SharePoint archive to accommodate MS Teams (online discussion) channels focused on each assessment resource and data source. These channels host most of the Assessment Committee's asynchronous discussions.

The following folder structure is used to logically organize the archive (folders listed alphabetically by name):

- *Coursework Results.* Contains one spreadsheet per assessment cycle containing the combined coursework assessment results, broken down by Student Outcome, degree program, and campus.
- *CptS 260.* We assess student work in CptS 260 ("Computer Architecture") in odd years relative to SO 2. This folder contains prompts for assignments assessed, student work samples assessed, assessment committee's ratings of those samples, and justifications of their ratings (spreadsheets).
- *CptS 322.* We assess student work in CptS 322 ("Software Engineering") in even years relative to SO 7. This folder contains prompts for assignments assessed, student work samples assessed, assessment committee's ratings of those samples, and justifications of their ratings (spreadsheets).
- *CptS 350.* We assess student work in CptS 350 ("Algorithms") in odd years relative to SOs 1, 2, and 6. This folder contains prompts for assignments assessed, student work samples assessed, assessment committee's ratings of those samples, and justifications of their ratings (spreadsheets).
- *CptS 355.* We assess student work in CptS 355 ("Programming Languages") in odd years relative to SOs 1, 2 and 6. This folder contains prompts for assignments assessed, student work samples assessed, assessment committee's ratings of those samples, and justifications of their ratings (spreadsheets).
- *CptS 423.* We assess student work in CptS 423 ("Senior Design Project II") in odd years relative to SOs 1, 2, and 6, and in even years relative to SOs 3, 5, and 7. This folder contains prompts for assignments assessed, student work samples assessed, assessment committee's ratings of those samples, and justifications of their ratings (spreadsheets).
- *CptS 487.* We assess student work in CptS 487 ("Software Design and Architecture") in odd years relative to SOs 1, 2, and 6. This folder contains prompts for assignments assessed, student work samples assessed, assessment committee's ratings of those samples, and justifications of their ratings (spreadsheets).
- *CptS-EE 302.* We assess student work in CptS/EE 302 ("Professional Skills in Computing and Engineering") in even years relative to SOs 3 and 4. This folder contains prompts for assignments assessed, student work samples assessed, assessment committee's ratings of those samples, and justifications of their ratings (spreadsheets). This assessment is done in addition to the assessment of the Professional Skills Discussions which target SOs 3, 4, and 7.
- *EE 214.* We assess student work in EE 214 ("Design of Logic Circuits") in odd years relative to SOs 1, 2, and 6. This folder contains prompts for assignments assessed, student work samples assessed, assessment committee's ratings of those samples, and justifications of their ratings (spreadsheets).
- *EE 234.* We assess student work in EE 234 ("Microprocessor Systems") in even years relative to SO 3. This folder contains prompts for assignments assessed, student work samples assessed, assessment committee's ratings of those samples, and justifications of their ratings (spreadsheets).
- *EE 321.* We assess student work in EE 321 ("Electrical Circuits II") in odd years relative to SOs 1 and 2. This folder contains prompts for assignments assessed, student work samples assessed, assessment committee's ratings of those samples, and justifications of their ratings (spreadsheets).
- *EE 416.* We assess student work in EE 416 ("Senior Design Project II") in odd years relative to SOs 1, 2, and 6, and in even years relative to SOs 3, 4, 5, and 7. This folder contains prompts for assignments

assessed, student work samples assessed, assessment committee's ratings of those samples, and justifications of their ratings (spreadsheets).

- *Curricula and Maps*. Contains spreadsheets listing the required courses for our degree programs and mapping them to the SOs and performance indicators they address.
- *Executive Council.* Notes from our Executive Council meetings
- *Faculty Retreat.* Slides and notes from faculty retreats.
- *General.* All MS Teams sites are required to have a "General" discussion channel. The files associated with this discussion channel are included in this folder. Note that we do not anticipate storing any files in this folder.
- *Job Placement. S*preadsheets that document our graduate's job placement progress based on both the senior exit survey and a follow-up job placement survey administered three months and one year after graduation.
- *Junior Writing Portfolio*. Biennial Junior Writing Portfolio reports generated by the WSU Writing Center.
- *Process and Manual.* Our assessment manuals that thoroughly document our assessment process.
- *Professional Skills Discussions.* Prompts for professional skills discussion assignments, transcripts of the professional skills discussions assessed, assessment committee members' ratings of the discussions, and justifications of their ratings (spreadsheets).
- *Reports*. Annual assessment reports that document all assessment results, findings and recommendations (PDF and/or Word documents).
- *Senior Exit Survey*. Raw data from the surveys (spreadsheets), summaries of survey results (PDF documents generated by Qualtrics), and analyses of survey results (spreadsheets with embedded charts and tables).
- *Senior Teamwork Survey*. Raw data from senior teamwork surveys administered in our senior design courses (spreadsheets), and analyses of survey results (spreadsheets).
- *SOs and Perf Indicators.* Documents listing our Student Outcomes (SOs) and their associated Performance Indicators (PIs) for each degree program.
- *Teaching Excellence.* Annual reports from the Teaching Excellence Committee. These reports were discontinued as of the 2018-19 assessment cycle.

Appendix B: Unified ABET Student Learning Outcomes and Performance Indicators for EE, CE, SE, and CptS Degree Programs, School of EECS, WSU

1. ***An ability to identify, formulate, analyze and solve complex computing and engineering problems by applying principles of engineering, computing, science, mathematics, and other relevant disciplines.***
   Performance Indicators:
   a. Decomposes a real-world scenario or problem statement into set of subproblems that need to be addressed in order to solve the original problem.
   b. Identifies constraints and/or requirements of a problem.
   c. Formulates problems in such a way that they can be addressed through approaches appropriate to the discipline, including approaches from engineering, computing, science, and mathematics.
   d. Chooses an approach, method, or tool that is appropriate to addressing the problem at hand.
   e. Applies principles, methods, or tools from engineering, computing, science, mathematics, and/or other relevant disciplines to identify viable approaches and correctly solve problem.
2. ***An ability to design, implement and evaluate engineering and computing solutions that meet specified requirements with consideration of public health, safety, and welfare concerns, as well as global, cultural, social, environmental, and economic factors.***
   Performance Indicators:
   a. Formulates one or more viable designs to meet a given set of needs/requirements.
   b. Articulates tradeoffs among multiple solutions that meet given set of needs/requirements.
   c. Identifies considerations, constraints and factors within problem context that are relevant to meeting specified needs/requirements.
   d. Prioritizes considerations, constraints, and factors that are relevant to meeting specified needs/requirements based on sound rationale.
   e. Applies appropriate strategies to evaluate the ability of a solution to meet specified requirements.
   f. Demonstrates sensitivity to a range of considerations (e.g., public health, safety, welfare) and factors (e.g., global, cultural, social) when developing solutions.
   g. Implements one or more solutions to meet specified needs/requirements.
3. ***An ability to communicate effectively with a range of audiences in a variety of professional contexts.***
   Performance Indicators:
   a. Applies standard rules of grammar, syntax, and structure in written and oral work.
   b. Demonstrates use of conventions particular to the discipline (e.g., organization, language choice, document type, source citation guidelines, and stylistic choices) in writing and presentations.
   c. Considers context, audience, and purpose in writing and presentations.
   d. Uses sources, examples, analogies, illustrations, and statistics to support claims.
   e. Uses graphical materials (e.g., illustrations, tables, schematics, photos, etc.) to support and extend the verbal or written components of documents and presentations.
   f. Uses delivery techniques such as posture, gesture, eye contact, enunciation, voice projection, vocal expressiveness to engage the audience during oral presentations.
4. ***An ability to recognize ethical and professional responsibilities in engineering and computing situations and make informed judgments based on legal and ethical principles, and with consideration of global, economic, environmental, and societal impacts.***
   Performance Indicators:
   a. Identifies professional, ethical, legal, security, and societal dimensions of a decision or action and its potential impacts on individuals, companies/organizations, the public, and/or other relevant stakeholders.

b. Articulates cost, schedule, and risk components of a computing or engineering project with consideration of ethical impacts.
c. Recognizes and distinguishes between different or competing ethical theories, frameworks, and/or perspectives relevant to computing or engineering scenario.
d. Applies the standards of a professional code of ethics to determine an appropriate course of action.
e. Uses an ethical theory, framework, or perspective to analyze a computing or engineering scenario and identify acceptable courses of action.
f. Explains professional, ethical, and social considerations in an engineering or computing context.

5. ***An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.***
Performance Indicators:
a. Performs actions that demonstrate leadership in interactions with team members.
b. Performs actions that support team members in team interactions.
c. Demonstrates effort to include all team members in efforts and decisions of team.
d. Demonstrates ability to establish goals, plan tasks, and meet objectives in a team environment.
e. Fulfills different roles on teams and in meetings.
f. Fulfills individual responsibilities outside of team meetings.
g. Provides feedback; seeks and is receives feedback; and is exposed to different approaches and/or perspectives of team members.

6. ***An ability to apply appropriate computing and engineering approaches, theories, and fundamentals to conduct appropriate experimentation, analyze and interpret data, use engineering judgment to draw conclusions, and produce solutions.***
Performance Indicators:
a. Applies engineering or computing theory and/or design principles/approaches to develop solutions.
b. Applies testing and experimentation approaches/methods to evaluate and reason about solutions.
c. Draws conclusions and inferences and/or makes decisions that are based on, and consistent with, available data and analyses.
d. Identifies additional tests, data, and/or analyses that are needed to draw conclusions and/or make decisions.

7. ***An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.***
Performance Indicators:
a. Determines the extent and type of information needed for the problem at hand.
b. Applies metacognitive skills during problem-solving, including the ability to assess process and progress, determine when stuck, and identify appropriate strategies to make progress.
c. Employs search strategies to obtain information needed to solve the problem at hand.
d. Accesses information from multiple information sources.
e. Demonstrates ability to assess the credibility and applicability of information sources.
f. Demonstrates ability to use information and apply knowledge to solve the problem at hand.
g. Integrates new knowledge and discoveries into what is already known.

Appendix C: Sample CptS/EE 302 Project Prompt Used to Elicit Professional Skills Discussions

Team Project: Online Professional Skills Discussion and Policy Statement
Released: Tuesday, Oct. 21
Initial Posts Due: Thursday, Oc. 31at 11:59 p.m.
Response Posts Due: Thursday, Nov. 7 at 11:59 p.m.
Policy Statement Thread Due: Thursday, Nov. 14 at 11:59 p.m.
Final Policy Statement Due: Thursday, Nov. 21 at 11:59 p.m.
Worth: 20% of your overall grade

Overview

This team project is designed to assess your knowledge of, and ability to apply, ethics and professional skills. The overarching purpose is to determine how well the computer science degree program has taught you this knowledge and these skills. In addition to counting toward your CptS 402 grade, the CptS Curriculum Committee will assess a sample of the team discussions. When the CptS Curriculum Committee assesses these discussions, all names will be anonymized.

For this project, you have either self-selected a team of students, or you have been randomly assigned to a team. As part of this team, you will engage in an online discussion to capture your thoughts, perspectives, ideas, and revisions as you consider a computing scenario. Through this online discussion, you will engage in a collaborative exchange and critique of each other's ideas and work. The goal is to challenge and support one another as a team, so that, as a team, you can (a) tap your collective resources and experiences, and (b) dig more deeply into the issue(s) raised by the computing scenario. In addition to engaging in an online discussion, your team will produce a policy statement that summarizes your proposed approach to the scenario.

Scenario

As discussed in class, several new technologies, including GPS tracking, surveillance cameras and automatic face recognition technology, make it increasingly easy to track the movements and whereabouts of people who are out in the world. Given these state-of-the-art of these technologies, suppose that your team is considering the possibility of launching a new Internet start-up company to develop "webcam history" technologies. [6] Using the latest and greatest facial recognition technology, your company proposes to continuously process the images of surveillance cameras. Based on this processing, your technology would make at least two new features possible:

(a) You can present visual timelines that provide a historical trace of the camera images (and locations) of a given person.

[6]This scenario was inspired by a description offered by Georgetown University law professor Jeffrey Rosen on a broadcast of "The Diane Rehm Show." See http://thedianerehmshow.org/shows/2011-11-02/constitution-today-fourth-amendment/transcript, and refer to timestamp 11:30:52.

(b) You can support historical and spatial searches for specific people and places, e.g., "Where was John Doe at 5 p.m. on March 15, 2008?," or "Who was at the Washington Monument at 6:33 p.m. on January 3, 2010?"

Note that some surveillance cameras are operated by public agencies, and are presently available online. Others are operated by public agencies, but used only by law enforcement. Still others are operated by private agencies. In order to gain access to those cameras that are not presently available online, your company would need to develop contracts with these agencies.
Possible users of your technology are both (a) individuals, who could access your technologies through a public website you develop, or (b) government agencies, for-profit businesses, and non-profit businesses, which could directly or indirectly (by licensing your technologies) use your technologies.

As a team, your task is to think about, discuss, and converge on the specific kinds of technologies you should and should not support, the people and places that should and should not be included in your searchable database, and the users who should and should not have access to your technologies. To that end, you will need to design and clearly articulate your company's ethical and social responsibilities policies, which will be ultimately codified in your "policy statement."

Guidance on Ethical and Social Responsibilities Policies

Your company will be required to provide detailed information to its constituents on the ethical and social responsibilities policies that you will follow. You are expected to do substantial research and conduct discussions before designing these policies for your site. Your policies must be based on, but not limited to, the ethical principles, Code of Ethics, facts, data, laws, and frameworks discussed in the course. You are required to cite all external sources of information, both in your discussion and in your final policy statement. Examples of policies to consider include, but are not limited to:

Users' Personal Information

1. In addition to the Webcam History records, what personal information is collected from the user and why?
2. Do you have opt-in or opt-out option policies? If so, for what information?
3. How secure should your database be? Why?
4. How and what information is made available to law enforcement (government) agencies without a court order?
5. How and what information is used for user profiling?
6. What information is shared with (or sold to) third-party vendors?

Access to your technology

1. How transparent/easy to see/understand are your policies to your users?
2. Is any Webcam History information exempted from being collected, disseminated, or sold? Why?
3. Do you buy/sell Webcam History data? If so, for what purpose?
4. Is your technology available in multiple countries? What are the implications?

Project Timeline

You will have **four weeks** to complete the online discussion and produce a policy statement with regard to this scenario. To foster the refinement and maturation of ideas, ensure that you actively participate, and

adhere to the deadlines described below. It is important to make your initial posts (and subsequent responses) in a timely manner. Your initial post, which you will compose independently, is due by **11:59 p.m. on Thursday, October 31**. You are expected to make multiple posts during each stage of this on-going discussion. The timeline below suggests how to pace your discussion. This is just a suggestion. Feel free to pace the discussion as you see fit, but note that your grade will be partly based on how well you adhere to these deadlines.

- *By Thursday, Oct. 31 at 11:59 p.m.: Make Initial Posts.* All participants post initial responses that address the scenario prompt and take into consideration the issues raised in the "Guidance on Ethical and Social Responsibilities Policies" section above. These initial posts must be a minimum of **500 words**. Note that you are expected to write these posts *independently*, without consulting your other team members. You will not be able to see others' posts until you make your initial posts. These posts are intended to provide the starting point for your team's deliberations.

- *By Thursday, Nov. 7 by 11:59 p.m.: Complete Response Posts*. Team members respond by tying together information and perspectives on important points and possible approaches. To that end, the team creates new discussion threads to address each the following (each discussion thread should be clearly labeled):

    - *Professional, ethical, legal, and social issues and responsibilities*. In this thread, engage in a discussion to identify professional, ethical, legal, and social dimensions of each proposed decision or policy. **The ethical frameworks and Code of Ethics discussed in the class must be enlisted to provide a rationale for and/or against each proposed decision or policy**. In cases where competing ethical perspectives or Code clauses are in conflict, the team should attempt to resolve the conflict by prioritizing competing perspectives/clauses and/or using its best judgment.

    - *Local and global impacts on individuals, organizations, and society*. In this thread, engage in a discussion that explicitly considers the local and global impacts of each proposed decision or action on key stakeholders, including individuals, organizations, and society. In addition, assess the certainty with which you can determine the impacts of each proposed decision or action.

    - *Further knowledge and research needed*. In this thread, engage in a discussion that identifies additional knowledge (facts, laws, statistics, etc.) that you need to know in order to make the best possible decisions or choose the best possible policies. Fill in the gaps you identify by performing research to seek and evaluate outside sources, making sure to cite each source. In cases where you choose not to perform additional research, identify appropriate methods you would use to obtain the information.

    - *Biases and assumptions*. In this thread, engage in a discussion to identify and analyze your personal biases and assumptions about the scenario. These biases and assumptions will be important to make explicit as you move toward identifying viable approaches and courses of action.

- *By Thursday, April 11 by 11:59 p.m. Complete Policy Statement thread*. Start a new thread entitled "Policy Statement," and use the thread to converge as a team upon a set of decisions and policies to address the scenario.

- *By Thursday, April 11 by 11*:59 p.m. *Submit Final Policy Statement Document*. Create a PDF document that brings together and synthesizes your team's final position. This statement should be at least 1,000 words, and be written as a polished essay in clear English. At a minimum, the statement should enumerate the set of policies and decisions your group would adopt, and clearly articulate your rationale for each one. Submit the PDF document through the "Team Policy Statement" assignment in OSBLE.

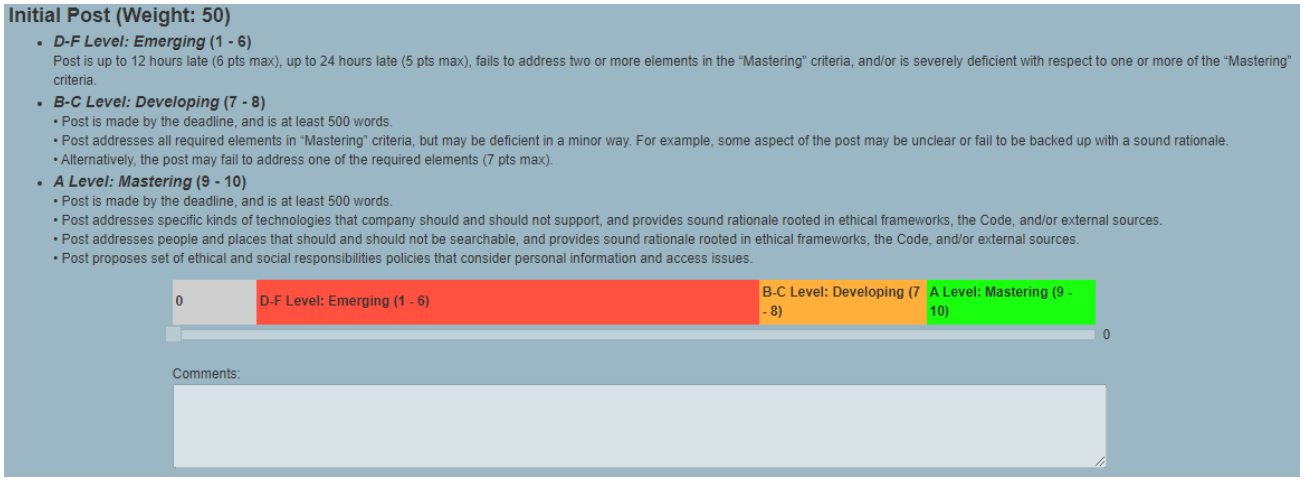
Assessing team members' contributions

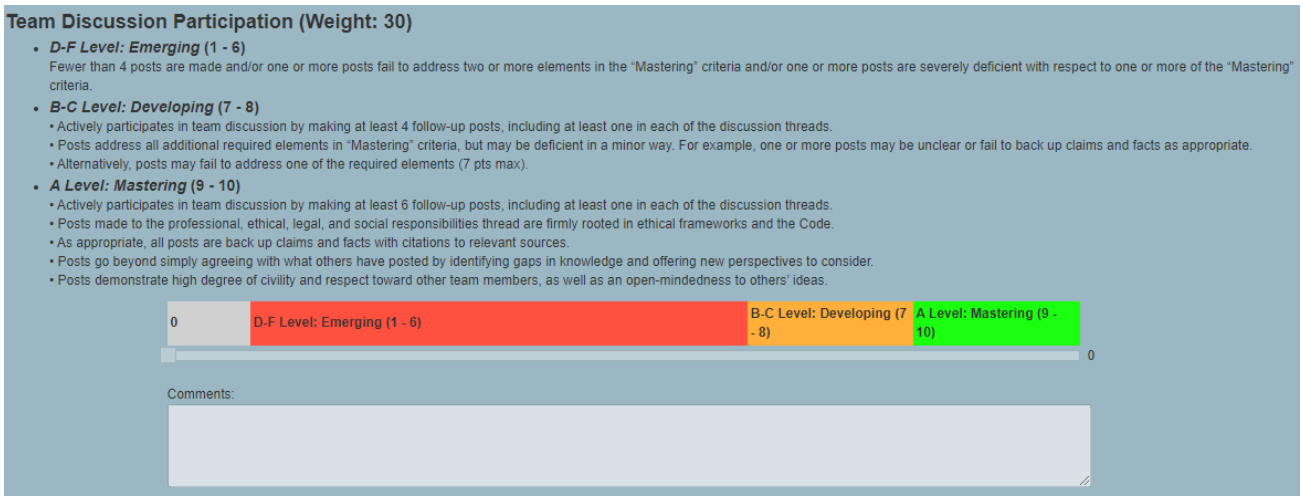
You are required to submit a team member evaluation of the contribution of each member of the team towards the final policy statement. (We will evaluate each team member's individual contributions in the online discussions separately, so please consider only each member's contribution to the final policy statement.) These evaluations will be used to weight each team member's policy statement grades based on his or her relative contribution. All team members are expected to contribute equally.

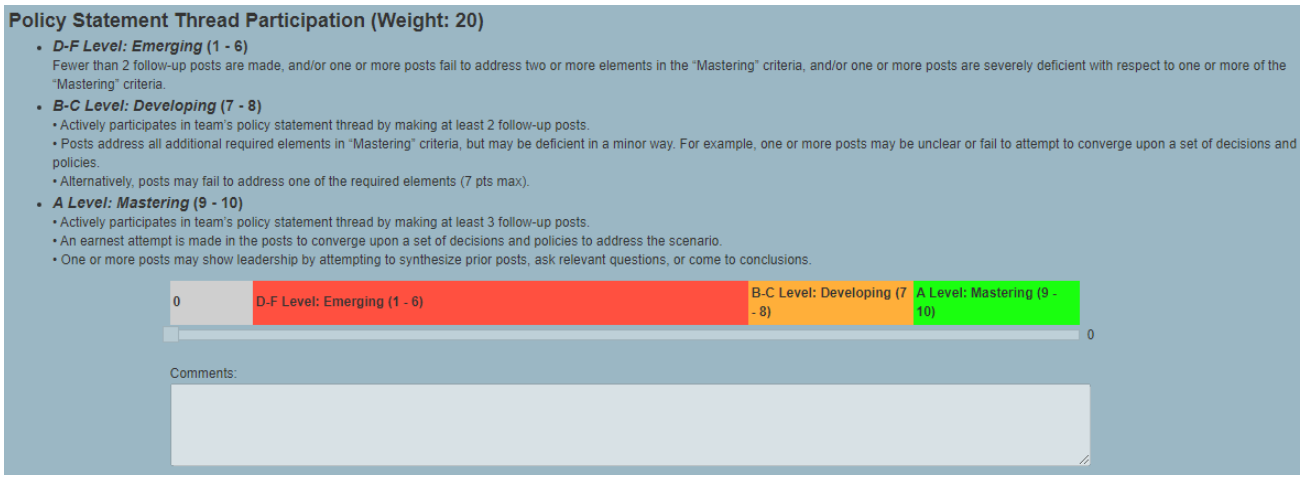
Grading

You will receive both an individual grade for your contribution to the online discussions (weighted 70%), and a team grade for your policy statement (weighted 30%). The multiplier that results from the team member evaluations will be applied to your policy statement grade. Both the online discussion contributions and the policy statement will be scored using detailed evaluation rubrics available on OSBLE.

Appendix D: Sample Rubric used to Grade Professional Skills Discussions in the CptS/EE 302 Course







Computer Science Program
Washington State University (WSU) Tri-Cities
2710 Crimson Way
Richland, WA 99354

Fall 2019 – Spring 2022
A 3-Year Assessment Plan for the BACS Program

Student Outcomes

The curriculum for the Bachelor of Arts (BA) degree in Computer Science (CS) is designed to attain the following student outcomes (SOs).

1. Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.
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.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

Appendix A provides a mapping of the SOs onto the curriculum.

Program Educational Objectives

Attainment of the SOs prepares the graduates to fulfill the following program educational objectives (PEOs).

1. Our graduates have professional careers in industry or academia or are engaged in advanced studies.
2. Our graduates keep abreast and adapt to changes in technology as well as the needs of a globalized society.
3. Our graduates are successful team members or team leaders who conduct themselves with integrity and act ethically.

A mapping of SOs with the PEOs is provided in Appendix B.

WSU Mission Statement

The PEOs are fully aligned with the WSU's mission statements. Washington State University is a public research university committed to its land-grant heritage and tradition of service to society. Our mission is threefold:

1. To advance knowledge through creative research, innovation, and creativity across a wide range of academic disciplines.
2. To extend knowledge through innovative educational programs in which students and emerging scholars are mentored to realize their highest potential and assume roles of leadership, responsibility, and service to society.
3. To apply knowledge through local and global engagement that will improve quality of life and enhance the economy of the state, nation, and world.

The 3-Year Assessment Plan
Courses Schedule of Assessment

Degree of attainment of the six SOs will be assessed by using graded student works (SWs) – examination, homework, quizzes, projects, reports, presentations – of selected "required" (R) courses according to the following schedule. Courses for assessment has been strategically selected to assess the degree of attainment in the best way possible. A tentative list of courses is presented below. The list can be modified by the Undergraduate Studies Committee (UGSC) to make the assessment more comprehensive.

BACS Assessment Plan for WSU Tri-Cities Computer Science Program

year	CptS	SO1 Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.	SO2 Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.	SO3 Communicate effectively in a variety of professional contexts.	SO4 Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.	SO5 Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.	SO6 Apply computer science theory and software development fundamentals to produce computing-based solutions.
2019-20	122	✔		✔			✔
	223	✔	✔				✔
	302				✔	✔	
	322		✔	✔		✔	
2020-21	121	✔		✔		✔	
	302			✔	✔		
	317	✔	✔				
	360		✔			✔	✔
	355	✔	✔				✔
2021-22	122	✔		✔		✔	
	302				✔	✔	
	322		✔	✔		✔	✔
	355	✔					✔
	260		✔				

The chair of the UGSC will work with the faculty to select assessment tools and develop grading rubrics to use it in assessing performance indicators (PIs) for all SOs.

The SOs, PIs, and associated grading rubrics is presented in Appendix D.

Computer Science Courses

Required Courses

The following are the required BACS courses.

1. CptS 121: Program Design and Development
2. CptS 122: Data Structures
3. CptS 223: Advanced Data Structures
4. CptS 260: Introduction to Computer Architecture
5. CptS 302: Professional Skills in Computing and Engineering
6. CptS 322: Software Engineering Principles I
7. CptS 355: Programming Language Design

Technical Electives

At least 12 credit hours must be in CPT S courses and include a minimum of 6 credits of 400- or 500-level courses. These courses must include at least two of the following "Advanced CptS Electives" (catalog term):

1. CptS 427: Computer Security
2. CptS 440: Artificial Intelligence
3. CptS 442: Computer Graphics
4. CptS 460: Operating Systems
5. CptS 471: Computational Genomics
6. CptS 481: Python Software Construction

The WSU Tri-Cities CptS Assessment Process

This document describes the process the WSU Tri-Cities Computer Science faculty undertakes to do self-assessment in order to maintain continuous improvement. Inputs include:

- course assessment data
- meetings with members of the Industrial Advisory Board
- student exit interviews
- transcripts

We will organize these activities chronologically. These tasks will be overseen by the Assessment Coordinator (AC, see below).

1. At the start of every semester:
    - According to the 3-year assessment plan, the AC marks up copies of the Assessment Student Outcome Mapping (ASOM) document and distributes them to the instructors whose courses are identified for assessment that year. (This is so that instructors know what data is expected of them.) The AC gets commitments from each instructor to do this.
2. Shortly before the end of every semester:
    - The AC sends reminders to all instructors about the need to fill in the ASOM if they have not already done so. (Include copies of the ASOM in case they lost the earlier one.)
3. At the end of every semester:
    - The AC collects all ASOMs and grading data from each instructor whose course is being assessed that year. Grading data should be separated by degree program.
    - The AC enters data into standardized Student Outcome Assessment Spreadsheets (SOASs).
4. At the end of the Spring semester:
    - The AC holds a meeting with the Industrial Advisory Board (IAB) to discuss the curriculum and program educational outcomes (PEOs). Someone takes minutes. (Zoom transcript?)
    - (Every six years) The AC collects transcripts for transcript analysis.
    - The AC requests exit interview (EI) data from the undergraduate advisor together with its analysis and presents it to the Undergraduate CS Studies Committee.
    - Hold a meeting with all faculty to discuss all of the above data. (All regular faculty must attend and adjuncts are invited.) Someone takes minutes. (Zoom transcript?)
    - The AC produces a Continuous Improvement and Annual Assessment Reports, which are reviewed and approved by the regular faculty.
    - Designate next year's AC. (This will be a revolving office distinct from ABET Coordinator.)

Appendix A
Mapping of SOs onto the curriculum

Mapping Between CptS Core Curriculum and Student Outcomes

Core Course BACS Program	Student Outcomes					
	1	2	3	4	5	6
CptS121: Program Design and Development	X	X	X		X	X
CptS122: Data Structures	X	X	X		X	X
CptS223: Advanced Data Structures	X	X				X
CptS260: Introduction to Computer Architecture	X	X				X
CptS322: Software Engineering Principles I	X	X	X		X	X
CptS355: Programming Language Design	X	X				X
CptS302: Professional Skills in Computing Engineering			X	X	X	

Appendix B
Relationship of Student Outcomes to Program Educational Objectives

SOs	PEO 1	PEO 2	PEO 3
1. Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.	▯		
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.	▯		▯
3. Communicate effectively in a variety of professional contexts.	▯		▯
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.an understanding of professional, ethical, legal, security, and social issues and responsibilities,	▯	▯	▯
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.	▯		▯
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.	▯		▯

Appendix C
Correspondence between WSU Mission and CptS Educational Objectives

The PEOs are fully consistent with the mission of WSU as shown in the following table. Here "S" indicates a strong support of the mission for the PEOs with "M" indicating a moderate support.

Washington State University Mission Statement	Graduates have professional careers in industry or academia or are engaged in advanced studies.	Graduates keep abreast and adapt to changes in technology as well as the needs of a globalized society	Graduates are successful team members or team leaders who conduct themselves with integrity and act ethically.
To advance knowledge through creative research and scholarship across a wide range of academic disciplines	S	M	
To extend knowledge through innovative educational programs in which emerging scholars are mentored to realize their highest potential and assume roles of leadership, responsibility, and service to society	M		S
To apply knowledge through local and global engagement that will improve quality of life and enhance the economy of the state, nation, and world	M	S	M

S – Strongly supports
M- Moderately supports

Appendix D
SOs, PIs, and Grading Rubrics

Performance Indicators for 2019 ABET CptS Student Learning Outcomes
School of EAS, WSU Tri-Cities
Last modified 5 June 2018

1. ***Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.***
   Performance Indicators:
   a. Decomposes a real-world scenario or problem statement into set of subproblems that need to be addressed in order to solve the original problem.
   b. Identifies constraints and requirements of a problem.
   c. Formulates computing problems in such a way that they can be addressed through approaches and methods appropriate to the discipline.
   d. Chooses an approach, method or tool that is appropriate to addressing the problem at hand.
   e. Applies principles, methods, or tools from engineering, computing, science, mathematics and/or other relevant disciplines to identify viable approaches and correctly solve problem.
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.***
   Performance Indicators:
   a. Formulates one or more viable system designs to meet specified requirements.
   b. Articulates tradeoffs among multiple solutions that meet specified requirements.
   c. Identifies considerations, constraints and factors within problem context that are relevant to meeting specified requirements.
   d. Prioritizes considerations, constraints, and factors that relevant to meeting specified requirements based on sound rationale.
   e. Applies appropriate strategies to evaluate the ability of a solution to meet specified requirements
   f. Demonstrates sensitivity to a range of considerations (e.g., public health, safety, welfare) and factors (e.g., global, cultural, social) when developing solutions.
   g. Implements one or more solutions to meet specified requirements.
3. ***Communicate effectively in a variety of professional contexts.***
   Performance Indicators:
   a. Applies standard rules of grammar, syntax and structure in written and oral work.
   b. Demonstrates use of conventions particular to the discipline (e.g., organization, language choice, document type, source citation guidelines, and stylistic choices) in writing and presentations.
   c. Considers context, audience and purpose in writing and presentations.
   d. Uses sources, examples, analogies, illustrations, and statistics to support claims.
   e. Uses graphical materials (e.g., illustrations, tables, schematics, photos, etc.) to support and extend the verbal or components of documents and presentations.
   f. Uses delivery techniques such as posture, gesture, eye contact, enunciation, voice projection, vocal expressiveness to engage the audience during presentations.
4. ***Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.***
   Performance Indicators:
   a. Identifies professional, ethical, legal, security, and societal dimensions of a decision or action and its potential impacts on individuals, companies/organizations, the public, and/or other relevant stakeholders.
   b. Articulates cost, schedule, and risk components of a computing or engineering project with consideration of ethical impacts.
   c. Recognizes and distinguishes between different or competing ethical theories, frameworks, and/or perspectives relevant to computing scenario.

d. Applies the standards of a professional code of ethics to determine an appropriate course of action in a scenario involving computing technology.
e. Uses an ethical theory, framework, or perspective to analyze a scenario involving computing technology, and to identify acceptable courses of action.
f. Explains professional, ethical, and social considerations in a computing context.

5. ***Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.***

Performance Indicators:

a. Performs actions that demonstrate leadership in interactions with team members.
b. Performs actions that support team members in team interactions
c. Demonstrates effort to include all team members in efforts and decisions of team
d. Demonstrates ability to establish goals, plan tasks, and meet objectives in team environment
e. Fulfills different roles on teams and in meetings.
f. Fulfills individual responsibilities outside of team meetings.
g. Provides feedback; seeks and receives feedback; and is exposed to different approaches and/or perspectives of team members.

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

Performance Indicators:

a. Applies engineering or computing theory and/or design principles/approaches to develop solutions. (*Examples of appropriate computing theory include Big-O, graph theory, theories of human perception, cognition, and social/cultural behavior, NP-completeness, finite state automata, combinatorics, proof techniques. Examples of appropriate computing design principles/approaches include top-down design, human-centered design, user interface design principles, agile development, functional decomposition, information hiding, abstraction, and object-oriented design.*)
b. Applies testing and experimentation approaches/methods to evaluate and reason about solutions. (*Examples of appropriate testing and experimentation approaches include boundary case analysis, unit testing, black-box testing, regression testing, low fidelity prototype testing, usability testing, beta testing, and field testing*.)
c. Draws conclusions and inferences and/or makes decisions that are based on, and consistent with, available data and analyses.
d. Identifies additional tests, data, and/or analyses that are needed to draw conclusions and/or make decisions.

Uniform Scoring Rubric

Unsatisfactory = 1	Needs Improvement = 2	Capable = 3	Exemplary = 4

The student work contains a number of elements that are confusing, inconsistent, inaccurate, biased, unrealistic or not credible. The students work contains glaring gaps or no evidence in addressing a given performance indicator.	The student work contain some elements that are confusing, inconsistent, inaccurate, biased, unrealistic or not credible. The student work contains evidence of a given performance indicator, but it is unclear to the evaluator the extent of a student understanding.	The student work contains most, but not all, of the following characteristics: realistic relevant, accurate, consistent, unbiased and credible. The student work addresses a given performance indicator in an obvious way.	The student work is consistently realistic, relevant, accurate, unbiased, and credible. The student work goes beyond the obvious and thoroughly addresses a given performance indicator, possibly in a creative or nuanced way.

In most cases, the tools used for quantifying PIs are examples of graded student work. In these cases, the assessor usually correlates the levels in Table 4.1 with students' grades. Typically, levels 1-4 are associated with less than 70% correct, 70-80% correct, 80-90% correct, and 90-100% correct, respectively.

A weighted average of performance on individual tools gives a score of performance on each PI. A simple average of performance on individual PIs provides a score of performance on an SO. The percentage of students in a class at each performance level is calculated. If 75% of students perform a levels greater than 2 (capable and exemplary), the SO has been attained in that class.

Student learning outcomes (SLOs) and associated performance indicators for BS Cybersecurity program

1. ***An ability to identify, formulate, analyze and solve complex computing and engineering problems by applying principles of engineering, computing, science, mathematics, and other relevant disciplines.***
   Performance Indicators:
   a. Decomposes a real-world scenario or problem statement into set of subproblems that need to be addressed in order to solve the original problem.
   b. Identifies constraints and/or requirements of a problem.
   c. Formulates problems in such a way that they can be addressed through approaches appropriate to the discipline, including approaches from engineering, computing, science, and mathematics.
   d. Chooses an approach, method, or tool that is appropriate to addressing the problem at hand.
   e. Applies principles, methods, or tools from engineering, computing, science, mathematics, and/or other relevant disciplines to identify viable approaches and correctly solve problem.

2. ***An ability to design, implement and evaluate engineering and computing solutions that meet specified requirements with consideration of public health, safety, and welfare concerns, as well as global, cultural, social, environmental, and economic factors.***
   Performance Indicators:
   a. Formulates one or more viable designs to meet a given set of needs/requirements.
   b. Articulates tradeoffs among multiple solutions that meet given set of needs/requirements.
   c. Identifies considerations, constraints and factors within problem context that are relevant to meeting specified needs/requirements.
   d. Prioritizes considerations, constraints, and factors that are relevant to meeting specified needs/requirements based on sound rationale.
   e. Applies appropriate strategies to evaluate the ability of a solution to meet specified requirements.
   f. Demonstrates sensitivity to a range of considerations (e.g., public health, safety, welfare) and factors (e.g., global, cultural, social) when developing solutions.
   g. Implements one or more solutions to meet specified needs/requirements.

3. ***An ability to communicate effectively with a range of audiences in a variety of professional contexts.***
   Performance Indicators:
   a. Applies standard rules of grammar, syntax, and structure in written and oral work.
   b. Demonstrates use of conventions particular to the discipline (e.g., organization, language choice, document type, source citation guidelines, and stylistic choices) in writing and presentations.
   c. Considers context, audience, and purpose in writing and presentations.
   d. Uses sources, examples, analogies, illustrations, and statistics to support claims.
   e. Uses graphical materials (e.g., illustrations, tables, schematics, photos, etc.) to support and extend the verbal or written components of documents and presentations.
   f. Uses delivery techniques such as posture, gesture, eye contact, enunciation, voice projection, vocal expressiveness to engage the audience during oral presentations.

4. ***An ability to recognize ethical and professional responsibilities in engineering and computing situations and make informed judgments based on legal and ethical principles, and with consideration of global, economic, environmental, and societal impacts.***
   Performance Indicators:

a. Identifies professional, ethical, legal, security, and societal dimensions of a decision or action and its potential impacts on individuals, companies/organizations, the public, and/or other relevant stakeholders.
b. Articulates cost, schedule, and risk components of a computing or engineering project with consideration of ethical impacts.
c. Recognizes and distinguishes between different or competing ethical theories, frameworks, and/or perspectives relevant to computing or engineering scenario.
d. Applies the standards of a professional code of ethics to determine an appropriate course of action.
e. Uses an ethical theory, framework, or perspective to analyze a computing or engineering scenario and identify acceptable courses of action.
f. Explains professional, ethical, and social considerations in an engineering or computing context.

5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

Performance Indicators:

a. Performs actions that demonstrate leadership in interactions with team members.
b. Performs actions that support team members in team interactions.
c. Demonstrates effort to include all team members in efforts and decisions of team.
d. Demonstrates ability to establish goals, plan tasks, and meet objectives in a team environment.
e. Fulfills different roles on teams and in meetings.
f. Fulfills individual responsibilities outside of team meetings.
g. Provides feedback; seeks and is receives feedback; and is exposed to different approaches and/or perspectives of team members.

6. ***An ability to apply appropriate security principles and practices, computing and engineering approaches, theories, and fundamentals to conduct appropriate experimentation, analyze and interpret data, use engineering judgment to maintain operations in the presence of risks and threats, draw conclusions, and produce solutions.***

Performance Indicators:

a. Applies engineering or computing theory and/or security principles/approaches to develop solutions.
b. Applies testing and experimentation approaches/methods to evaluate cybersecurity threats to system operation.
c. Applies security principles and practices to maintain operations in the presence of risks and threats.
d. Applies testing and experimentation approaches/methods to managing risks in system operation.
e. Identifies tests, data, and/or analyses that are needed to draw conclusions and/or make decisions.

7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Performance Indicators:

a. Determines the extent and type of information needed for the problem at hand.
b. Applies metacognitive skills during problem-solving, including the ability to assess process and progress, determine when stuck, and identify appropriate strategies to make progress.
c. Employs search strategies to obtain information needed to solve the problem at hand.
d. Accesses information from multiple information sources.

e. Demonstrates ability to assess the credibility and applicability of information sources.
f. Demonstrates ability to use information and apply knowledge to solve the problem at hand.
g. Integrates new knowledge and discoveries into what is already known.

NEW PROGRAMS OR EXTENDING A DEGREE: ANALYZING LIBRARY CAPACITY

Complete this workbook to assess the adequacy of library holdings and services prior to filling in the New Program Proposal Template itself. You will transfer a summary of the key findings of the workbook to the new program/extending a degree proposal form.

The Faculty Senate Library Committee reviews all proposals for new degree and extended degree programs for adequacy of library holdings and services. To assist the committee in its deliberations, please address the topics below in your proposal in collaboration with the librarian(s) responsible for collection development in your discipline(s). The names of appropriate librarians are available from the Director of Libraries at 335-4558 or from your dean's office.

1. **In specific terms, describe the adequacy of existing capacity:**

Questions to ask:

- How adequate are the existing library collections for the proposed program?
- How adequate is the existing library equipment for the proposed program?
- How adequate are the existing personnel and services for the proposed program?
- How will this program contribute to the funding of existing serials, given their ever increasing costs?

Answer here:

We do not anticipate the proposed BS in Cybersecurity program to be requiring additional library resources, as of 9/2/2022. Given the nature of Cybersecurity field: we forecast that our students will rarely, if ever, utilize the services of the WSU System Libraries. As such, existing library collections, equipment, personnel, and services will be adequate for serving the proposed program's needs.

If needed, our program can contribute to the funding of maintaining existing library infrastructure using a funding model similar to the one used by the BS in Computer Science degree.

2. What is the need for new library collections:

Areas to consider:

1. Serials (e.g., journals or indexes in print, electronic format, microform, etc.):
    a. List new serials titles (and costs) that will be needed.
    b. What funds have been designated for these titles and for the ongoing serials subscriptions?
    c. Can any of your current serials subscriptions be cancelled to purchase the new titles?
    d. What additional library equipment will be needed and how will it be funded (e.g., computers, desks/tables, etc.)?

2. Monographs (e.g., books in print, electronic format, etc.):
    a. Will monographs need to be purchased?
    b. Have continuing funds been designated for these and future purchases?
    c. What additional library equipment will be needed and how will it be funded?

3. Media (e.g., DVDs, sound recordings, etc.):
    a. Are media materials needed?
    b. Have funds been designated?
    c. What additional multimedia equipment will be needed and how will it be funded?

Answer here:

We do not anticipate a need for any new library collections for the BS in Cybersecurity program, as of 9/2/2022.

3. **What new library personnel will be needed?**

Questions to ask:

- Will specialized expertise be required to serve your new program?
- Will additional library staff or faculty need to be hired?
- If so, how will the position(s) be funded?

Answer here:

We do not anticipate a need for any new library personnel for the BS in Cybersecurity program, as of 9/2/2022.

4. **What additional library services will be needed?**

Questions to ask:

- To what extent will additional interlibrary loan services be required?
- On-line network access?
- References services?
- Library user education?
- If so, have funds been designated for this purpose?

Answer here:

We do not anticipate a need for any new additional library services for the BS in Cybersecurity program, as of 9/2/2022.

5. **For programs offered away from the Pullman campus: To what extent will collections and services be provided from Pullman and to what extent by other campus or local libraries?**

Answer here:
We do not anticipate a need for any inter-campus library collection/service transfer for the BS in Cybersecurity program, as of 9/2/2022.

6. **Are there any other library resource considerations *(e.g., additional space)*?**

Answer here:
We do not anticipate a need for any other library resource considerations for the BS in Cybersecurity program, as of 9/2/2022.

Please summarize this information on the new Program Proposal Template.

Explanation about Lab Science Requirement and its adherence to UCORE requirement

The BS in Computer Science (BSCS) degree program has recently made a change to the Physics and lab science requirements and implementation of the new Lab Science Requirement are the result of a long-standing conversation with other state institutions, Joint Transfer Committee, WSU Transfer Clearinghouse and WSU faculty. The lab science requirement change to BSCS degree program is currently under consideration by the Faculty Senate. The Lab science requirement for the new BS in Cybersecurity degree program is similar to that for BSCS and we have included the justification from that for the BSCS program.

WSU has for many years required a full year of calculus-based physics (Physics 201/211 and 202/212) in spite of being one of the few Computer Science programs in the state to require a full year of physics. With conversations of a new state-wide Associates of Science Transfer degree specializing in Computer Science moving forward, a more critical look was taken as to the justification for this requirement particularly in light of the fact all other major four-year institutions in the state are more flexible in allowing students to meet their physical and natural science requirements. After careful review it was determined that requiring a full year of calculus-based physics did not benefit the student learning objectives of our program and in many cases added unnecessary barriers to entry.

A major goal of this change was to increase the flexibility of course selection for students, particularly transfer students. The list of 6 courses (Chem 105, 106, Physics 201/211, 202/212, Biology 106, 107) were identified as the primary courses used by science and engineering majors within the college and maintained adherence to ABET accreditation requirements (professional program accreditation). The addition of Chem 105 and 106 opens the door for transfer students who frequently opt for chemistry over physics when earning their Associate of Arts (AA) degrees or simply taking classes at community college. WSU's Computer Science program was at a significant transfer student recruitment disadvantage compared to other four-year institutions who allowed these and other options.

Consulting with the Transfer Clearinghouse on how to best implement a lab science requirement revision resulted in listing a credit requirement rather than a simple course requirement. The primary driving factor for a credit requirement was that Physics 201/211 and 202/212 have historically been a challenge for transfer students given how it transfers to WSU from most state community colleges. Students need to transfer in quarter one and three for Physics 201/211 credit and quarter two and three for Physics 202/212. This makes it extremely rare for transfer students to get credit for Physics 201/211 without having completed the full year series at a community college and when the full year isn't required for the AA degree most students stop a quarter short of the full year.

After much debate the lab science requirement was determined to be six credits rather than seven so as to facilitate maximum flexibility for students, particularly transfer students. Students transferring in either an Associate of Science Transfer (AST) or Direct Transfer Associate (DTA) AA degree have their BSCI and PSCI UCORE requirements satisfied as part of a state-wide transfer agreement. The six-credit language used allows transfer students to take advantage of the fact their AA satisfies UCORE and ensure they are meeting the course requirements

specifically. A seven-credit requirement would require all AA transfer students to take an additional course beyond UCORE and ABET requirements. For example: students transferring in an AA with two quarters of coursework equivalent to WSU Chem 105 would have 6.7 credits This would satisfy ABET, UCORE, and a six-credit lab science requirement This is not the case with a seven-credit degree specific lab requirement despite having satisfied both ABET and UCORE requirements.

It also offers increased flexibility for WSU students changing majors to BS Computer Science who may have already completed some of these courses as part of their initial major and completed the UCORE components. Examples include a Mechanical Engineering student with Chem 105, Physics 201/211, and Anim_Sci 205 or a Biology student with Biology 106, 107, and Physics 150. Having this flexibility will benefit students moving into the program with prior coursework in addition to transfer students. True first-year students will be advised to take Biology 106 and either Chem 105 or Physics 201/211 by default while allowing the option of a full-year in any area and an added UCORE of interest.

Reducing the number of science courses from three to two allows for the inclusion of an additional three credit computer science elective course and one credit student success introductory course. This adjustment will benefit retention and graduation rates by setting students up for success as has been shows with in other colleges such as the Carson College of Business and Edward R Murrow College of Communication. The additional computer science elective will increase the technical skills of our graduates

UCORE Requirement Adherence:

The list of courses and six-credit requirement ensure that UCORE requirements are satisfied despite appearance of being one credit short of the 7 required for graduation. UCORE requires "At least 7 credits comprised of one course in Biological Science [BSCI] and one course in Physical Science [PSCI], including one lab." This course list ensures students can meet the minimum 7 credits for UCORE in addition to the one lab requirement without the addition of any courses. While the catalog and academic requirements list both BSCI and PSCI, a clarifying note was added to remove confusion; "Graduation requires one BSCI and one PSCI." This ensures students only looking at the four-year plan know they need one of each and won't graduate by taking purely BSCI or purely PSCI courses to satisfy this requirement.

All listed courses have labs and are four credits with the exception of Physics 201 and 202 which have other reinforcing requirements. Physics is accompanied by a separate required lab course, 211 and 212, which are both specifically listed in this note in addition to being co-requisites for enrollment in 201 and 202 respectively "201 [PSCI] Physics for Scientists and Engineers I 3 Course Prerequisite: *PHYSICS 211 or concurrent enrollment*; MATH 171 with a C or better, or credit for or concurrent enrollment in MATH 172, 182, 273, or 315." The concern with a student potentially taking Physics 201 and 202 without having passed 211 is not possible given this pre-requisite requirements for Physics 202 and the language of the note ensures that in the event the pre-requisites are changed students will still be required to have both to satisfy the language of the requirement.

ABET Accreditation Adherence:

The previous year-long calculus-based physics requirement far exceeded what is required for Computer Science program accreditation requirements (this ABET requirement is common for Computer Science and Cybersecurity degree programs) which require “At least six semester credit hours (or equivalent) in natural science course work intended for science and engineering majors. This course work must develop an understanding of the scientific method and must include laboratory work.” where WSU was requiring double the number of semester credits and three times as much laboratory work than ABET criteria.

Reducing to a minimum of six credits from a list of six courses, all of which include a lab component, ensures that we are adhering to ABET accreditation requirement and not adding excessive additions for students to satisfy for graduation. The requirement of these six specific courses ensure that the full six credits are courses intended for science and engineering majors as not all BSCI and PSCI courses are intended for science and engineering majors.

Bachelor of Science, Cybersecurity (121 Credits)

Students are admitted to the Cybersecurity major upon demonstrating they are calculus-ready and making their intention known to the department. Calculus-ready is defined as having an ALEKS math placement score of 78% or higher; or completion of MATH 108, and 171 or a higher calculus course with a grade of C or better; or completing the Math AP with a score of 2 (places the student in MATH 171), or 3 (credit is given for MATH 171); or achieving an IB score of HL 5; or achieving a CLEP score of 50.

To remain in good standing students must complete CPTS 121 or 131 and CPTS 122 or 132 and CPTS 223 or 233. In addition, students must also complete MATH 171, 172, 216, and MATH 220 or 225, each with a grade of C or better, and earn a cumulative WSU GPA of 2.5 or higher upon completion of the above courses.

Alternate Pathway:
Completion of ALL standard pathway benchmarks, excluding MATH 216, CPTS 223/233. In addition complete the following courses: a [SSCI] course such as ECONS 101 or 102, ENGLISH 101, PHIL 201, and the [PSCI] requirement of Lab Science Requirement[2], all with a grade of C or better, and a 2.5 cumulative WSU GPA (or transfer GPA if no WSU GPA exists).

No courses listed in this schedule of study may be taken on a pass/fail basis. All courses must be completed with a grade of C or better.

First Year

First Term	*Credits*
CPTS 101	1
CPTS 121 or 131[1]	4
ENGLISH 101 [WRTG]	3
Humanities [HUM]	3
MATH 171 [QUAN]	4

Second Term	*Credits*
CPTS 122 or 132[1]	4
HISTORY 105 [ROOT]	3
MATH 172	4
MATH 216	3

Second Year

First Term	*Credits*
CPTS 223 or 233[1]	3
CPTS 260 or EE 234	3 or 4
MATH 220 or 225	2 or 3

Social Science [SSCI]	3
Lab Science Requirement[2]	4

Second Term	*Credits*
CPTS 317	3
CPTS 322 [M]	3
CPTS 321 or 323[4] or 355	3
Diversity [DIVR]	3
MATH 301 or PHIL 201	3
Complete Writing Portfolio	

Third Year

First Term	*Credits*
CPTS 302	3
CPTS 327	3
CPTS 350	3
CPTS 360 or 370[1]	4
ENGLISH 402 [WRTG] [M]	3

Second Term	*Credits*
CPTS 427	3
CPTS 451 or 415	3
CPTS Elective[3]	6
STAT 360	3

Fourth Year

First Term	*Credits*
Arts [ARTS]	3
Lab Science Requirement[2]	4
CPTS 428	3
CPTS 455	3
CPTS Elective[3]	3

Second Term	*Credits*
CPTS 426	3
CPTS 432 [CAPS] [M]	3
CPTS 439	3
CPTS Elective[3]	6
Complete Exit Interview and Survey	

Footnotes

1 Students may choose between a C/C++ (CPTS 121, 122, 223, 360) path or a Java programming (CPTS 131, 132, 233, 370) path. Transitivity allowed between tracks before taking CPTS 223/233. The C/C++ track is not available in Everett.

2 Lab Science Requirement: Minimum 6 credits from CHEM 105 [PSCI], 106, PHYSICS 201 [PSCI] and 211, 202 and 212, BIOLOGY 106 [BSCI], 107 [BSCI]. Graduation requires one BSCI and one PSCI.

3 Computer Science Electives: Five additional courses (minimum 9 credits 300-400 level CPTS courses) and must include one of CPTS 434, 437, 440, or 475. May include a maximum of 3 credits each of CPTS 490 and 499, or 3 credits each of CPT S 488, 499, and ENGR 489. Approved non-CPTS courses are: 300-400-level EE courses, CE 463, DTC 335, EM 464, MBIOS 478, MSE 302, PHYSICS 303, 443, and STAT 436.

4 CPTS 323 is only available in Tri-Cities.