Institutional Effectiveness Report
2020-2021

Program: Computer Science BS

College and Department: College of Engineering – Computer Science

Contact: Gerald C. Gannod

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

This mission is consistent with the University's mission to "provide leadership and outstanding programs in engineering, the sciences, and related areas that benefit the people of Tennessee and the nation" and with the University's commitment to the life-long success of students and to enrich the lives of people and communities in the Upper Cumberland region of Tennessee.

It is also consistent with Flight Plan, the University's strategic plan, and it's focus on improving student experience, transforming technology, and creating distinctive programs.

Program Goals:

PG 1. *Professionalism:* Our graduates will exhibit the clear communication, responsible teamwork, commitment to quality, personal self-organization, professional attitude, and ethics needed to engage in successful careers in industry, academia, and public service.

PG 2. *Leadership:* Our graduates will exhibit technical, personal, ethical, and professional leadership in their businesses, professions, and communities

PG 3. *Technical Proficiency***:** Our graduates will exhibit the technical proficiency and problem-solving skills required to positively impact organizations, people, and processes at the local and global levels

PG 4. *Life-long Learning:* Our graduates will exhibit an ability to be self-motivated, life-long learners who adapt to new technologies, tools, and methodologies to maintain the ability to respond to the challenges of a changing environment.

Student Learning Outcomes

SLO 1. Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.

SLO 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.

SLO 3. Communicate effectively in a variety of professional contexts.

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

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

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

A departmentally developed curriculum map can be found in Appendix 1 that shows the connections between courses and student learning outcomes.

Assessment Methods

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

2. *Yearly Faculty/Staff Retrospective (program/department level):* At the beginning of each academic year the faculty engage in a retrospective covering the previous year. These retrospectives include identification of successes, opportunities for improvement, questions people have that need resolving, and creation of action items for improvement.

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

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

5. *Senior Student Exit Surveys (Exit):* We have developed our own internally specified student exit survey conducted each semester and administered to graduating seniors. Several questions are asked that are related to specific course outcomes. This indirect assessment is conducted as a supplement to the direct assessments that examine student work. In this case, the students self-assess their perception of learning. NOTE: For 2020-2021 we substituted the quantitative student survey with a qualitative focus group data collection using a retrospective-style set of questions.

6. *Major Field Test (MFT):* Nationally-normed ETS Exam (global assessment) – We have administered the ETS Computer Science exam for several years as a supplemental data point for the program by mapping the three parts of the exam to two specific student outcomes

    a. Outcome 1: Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions,

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

7. *California Critical Thinking Skills Test (CCTST***)**: The CCTST is a nationally normed test that measures problem solving and decision making through formation of reasoned judgements. We use the CCTST as a supplement to the direct and indirect assessments we conduct for Student Outcome 1: Analyze a complex computing problem and apply principles of computing and other relevant disciplines to identify solutions.

8. *External Advisory Board Review:* We conduct a review of Program Educational Objectives on a two-year cycle. These reviews allow us to determine whether the results are consistent with the expectations of these industrial stakeholders.

Assessment Tools, Frequency of Measurement, Applicability, and Attainment

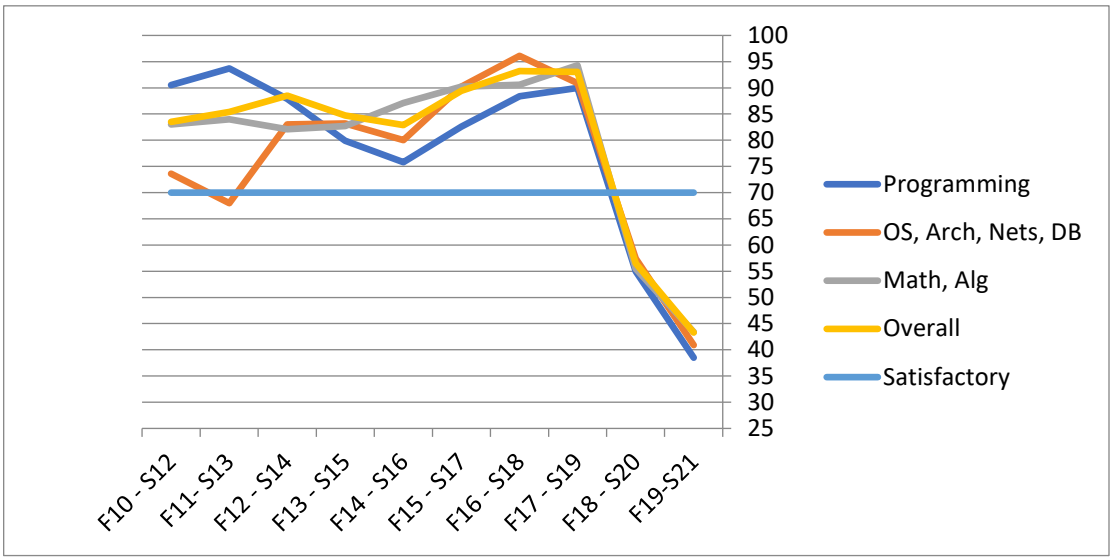
Assessment Tool	Frequency	Applicability	Attainment Expectation
Course Reflections	Semester	General	N/A
Retrospectives	Yearly	General	N/A
Direct Assessments of Student Work	Semester	1 – 6	Summative: 70% in E/P Formative: 70% in E/P/A
Pre-Post Surveys	Semester	1 – 6	Shift in mean
Senior Exit Surveys	Semester	1 – 6	70%
Major Field Test	Semester	1 and 6 only	70th percentile
CA Critical Thinking Test	Semester	1	19 or higher
Board Review	Yearly and Mid-cycle	PEOs	N/A

Results:

The 2020-2021 academic year was an end-of-cycle year which had the Department of Computer Science implementing a number of structural and programmatic modifications based on the observations from data collected in previous years. Faculty retrospective data, Senior exit (retrospective) data, major field test data, California Critical Thinking Test, and Stakeholder feedback was collected as usual. The next section. Our primary activity from 2020-2021 was focused on implementing improvements to the structure and content of the program. These modifications are described in detail in the next section.

Major Field Test

In the 2020-2021 reporting period we continued to observe a steady decline in the achievement levels of students completing the nationally normed ETS exam. The faculty examining these results are in agreement that the results are inconsistent with student outcomes observed in courses. It is noted that these exams were administered during the COVID-19 pandemic and that there was a shift in the medium with which the students took the exam (from written to online).



Our corrective action is the following: the department will begin using an alternative assessment method, as allowable by THEC, to measure student achievement in the senior year. Specifically, we will be shifting to a direct measure of student outcomes in the senior capstone, which will allow us to use the same methods being used for our ABET assessments.

California Critical Thinking Skills Test – 2020-2021

In the 2020-2021 reporting period, a 100pt scale was reported to the department. The comparative numbers against the previous two measurements is included. For 2020-2021, CS students (N=78) achieved an 80.5 mean on the 100pt scale. Programs at the university with higher achievement have an N <=10. For programs with N > 10, CS is the only program with mean > 80.

	Year 100pt Mean (number of students tested)		
	2018-2019	2019-2020	2020-2021
CS	83.0 (N = 70)	81.0 (N = 81)	80.5 (N = 78)
Rank at Institution for programs with N > 15	1	1	1
Overall Rank	T-3	2	4

Qualitative Data Collected in 2020-2021 from Stakeholders

A significant amount of data was collected in the 2020-2021 cycle from departmental and program stakeholders. Listening sessions with faculty, staff, administrators, graduating seniors, alumni, employers, and board members were conducted in the Fall 2020 and Spring 2021 semesters. In all, over 70 people took part in the sessions. The process used for the listening sessions is described below (as reported in a *strategic plan* for the department). Also included in this section is information from the

Stakeholder Engagement and Strategic Plan (excerpted from strategic plan)

The process used by the department to develop the strategic plan was based on a desire to maximize engagement and transparency. The department, along with its external advisory board, identified important questions for providing focus to stakeholder engagements. A series of focus group meetings were then conducted in the Spring 2021 semester, with a steering committee spending the time to analyze feedback while also formulating key values and focus areas. In all, we engaged with approximately 50 individuals that generated ideas in the thousands. From this work, a few key discussions between the department executive committee followed by discussions with the steering committee resulted in the values and strategic focus areas found in this document. These strategic focus areas were then used to formulate *Objectives and Key Results* (OKRs) (Doerr, 2018) that the department will use for achieve specific goals. We engaged with the stakeholder groups listed below in a variety of contexts including one-on-one interviews, focus group meetings, and working sessions in order to elicit ideas and feedback about current and future states for the department.

- Steering Committee (Board members, faculty, staff, students)
  - The steering committee was comprised of a number of faculty (3), staff (1), board members (3), and students (2). The sessions were facilitated by K2OH Solutions staff.
- Faculty (internal and external to the department)
  - Faculty in the department along with others in the College of Engineering were engaged in a focus group session.
- Students (student advisory council and other invited students)
- CS Board Members
- Industrial Contacts (Members of the Nashville CIO Council, Industrial Partners)
- Administrators (Dean Slater, Provost Bruce, President Oldham)

Questions

The context for focus group meetings and one-on-one interviews was set by posing a number of questions to participants as follows:

1. What do you know about our past, current, and future stakeholder needs, wants, and preferences that are relevant to our future direction?
2. What do you know about the capacity (e.g., the EAB composition, # of faculty, budget, funding, how we execute or plan) and strategic position (e.g., are we research or teaching focused, do we have the right mix of programs, etc.) of the department and university that are relevant to our future direction?
3. What do you know about the University and College vision and goals that inform the future of the department?
4. What do you know about the current realities and evolving dynamics of the market place, global conditions, industry, geo-political climate, CS profession, etc. that are relevant to our future direction?
5. Values shape the way we interact, the decisions we make, the outcomes of our students, and the knowledge we create. What values are important to the department and its stakeholders?

Example Comments from Stakeholders from Spring 2021 Listening Sessions

- Teach RPG as a language option (alum)
- Ensure students take other courses beyond their field of study (empl)
- Offer CS courses across the university (fac)
- Cybersecurity for critical infrastructure, networks (alum)
- Cyber for other disciplines (fac)
- Web development and web services/APIs (alum)
- More interdisciplinary courses (fac)
- Courses or affiliation with ORNL (student)
- Broader perspective across campus (admin)
- AI skills and applications that enable people to identify problems and solutions faster (alum)
- Grow in the data science area (alum)
- Provide problem solving experiences that are practical (empl)
- Data science (alum)
- Cloud computing – storage (alum)
- Solving real world problems (empl)
- Capstones (alum)
- Use Open-source textbooks (student)
- Students need more cloud experience (empl)
- Experiences relevant to today's challenges (alum)
- Connections to alumni (alum)
- Expand industry connections (student)

Fall 2020 Student Advisory Council (Transcribed from Fall 2020 Student Advisory Council Meeting)

Professionalism

- Positive
    - Software Engineering course interactions with real clients

    - Competition teams have emphasized professionalism
    - Clubs: teamwork
        - CyberEagles and cyber-SIGS
        - WiCyS clubs including mentorship
        - Student driven professionalism more powerful than prescribed activities in courses
        - Student Advisory Council
        - Game Dev Club is another avenue for teams, communication, and presentations
    - Program is combination of formal and informal
    - Professionalism course (3040)
        - Research paper and presentations
- Improvement
    - How do we extend the experience students get in clubs to students that are not participating in clubs?
    - "School is what you make it." The opportunities are provided by the department, students need to seize those opportunities
    - **Lower division courses should have some teamwork instruction and ethics that comes before 3040**
    - Mentorship opportunities expand beyond just Redshirt program

Leadership

- Positive
    - Opportunities for leadership have been provided through the clubs
    - No shortage of leadership opportunities
- Improvement
    - Need to have a way to develop leadership in underclass undergraduates; next wave of leadership needs to be encouraged
    - Some mentorship needed
    - Leadership development provided in group projects, but not in a formal way. Could be improved rather than assume students can do it; **provide instruction early in the program on leadership and management**

Technical Proficiency

- Positive
    - DevOps course has been a great addition to the program
    - Neuro-plasticity and foundations developed by courses; extra-curriculars provides means for application
- Improvement
    - Much of what is needed for a job is learned on the job
    - How do you get students to participate in all that is afforded to them? Especially, if there isn't a class
    - Debugging and more skills on development; course on testing; how to program with Stack overflow and Google
    - DevOps for everyone

Life-long Learning

- Positive
    - Experiential learning through research, internships, and hands-on clubs as an undergraduate has had a big impact on all of the objectives
- Improvement
    - Value of rationale and "why" we apply certain approaches; development through Bloom's taxonomy, continue to improve critical thinking skills (can never get enough of critical thinking)

Fall 2020 Senior Capstone

Went well

- Transfer process was positive (Anonymous)
- Started with C++ (Anonymous)
- Quality of the Cyberconcentration + CEROC (Anonymous, 3 Up Votes)
--- Hands-on infrastructure (Anonymous)
- Technical Proficiency: CS Program provides good foundation for technical proficiency (Anonymous, 14 Up Votes)
- Professionalism: SE course provides interactions at a professional level (Anonymous, 13 Up Votes)
- Leadership: Several opportunities to provide leadership through teamwork on projects (not just in 4610/20) (Anonymous, 9 Up Votes)
- Professionalism: Clubs provide students with communication and leadership opportunities (Anonymous, 9 Up Votes)
- Life-Long Learning: Several hands-on learning activities that go beyond the curriculum (internships clubs) (Anonymous, 7 Up Votes)
- Leadership: Clubs provide leadership opportunities (Anonymous, 4 Up Votes)
- Professionalism: Competition teams provide opportunities for communication (Anonymous, 3 Up Votes)
- Professionalism: CSC 3040 provides a good exposure to professionalism and ethics (Anonymous, 2 Up Votes)
- Technical Proficiency: DevOps course has been great addition to the program (Anonymous, 3 Up Votes)
- Technical Proficiency: Exposure to high level languages(java python) all the way to low level languages (x86) (Jonathan Bedingfield, 3 Up Votes)

To improve

- Technical Proficiency: Debugging and Testing should be included as a course in the program (Anonymous, 13 Up Votes)
- Life-long Learning: The rationale for why we apply certain approaches and why we are taking certain courses is needed (Anonymous, 9 Up Votes)
--- As we are learning a subject provide some context to how it will apply to future courses (Anonymous)
- Professionalism: Lower division courses should have some teamwork instruction and ethics before 3040 (Anonymous, 8 Up Votes)
--- PC 2500 COM 2500 (Anonymous)

- Technical Proficiency: DevOps should be a required course (Anonymous, 4 Up Votes)
- Leadership: Need more opportunities to develop leadership in students (Anonymous, 4 Up Votes)
- Technical Proficiency: Need a way to expand informal learning opportunities to help students learn topics outside of what is provided in courses (Anonymous, 2 Up Votes)
- Leadership: provide more leadership development opportunities earlier in the program (Anonymous, 2 Up Votes)
- Professionalism: Provide more extra-curricular opportunities for students to gain experience (Anonymous, 1 Up Vote)
- Provide earlier collaborative projects using version control (before Capstone). (Mina Kemp, 2 Up Votes)
- Could improve offerings of requirements and UX/UI (Anonymous, 1 Up Vote)
- Make commonly available a course for web development. (Mina Kemp, 4 Up Votes)

Questions to address
- Could approved cooperative education assignments/internships substitute 4620? (Anonymous, 8 Up Votes)
- Can we make cross-platform software easier use? (Anonymous)

Spring 2021

Went well
- Professionalism: SE course provides interactions at a professional level
- Professionalism: Competition teams provide opportunities for communication
- Professionalism: Clubs provide students with communication and leadership opportunities
- Professionalism: CSC 3040 provides a good exposure to professionalism and ethics
- Leadership: Several opportunities to provide leadership through teamwork on projects (not just in 4610/20)
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- Technical Proficiency: CS Program provides good foundation for technical proficiency
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- Technical Proficiency: DevOps should be a required course
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- Life-long Learning: The rationale for why we apply certain approaches and why we are taking certain

courses is needed

Modifications for Continuous Improvement

In the 2020-2021 reporting period a number of significant changes were introduced following the completion of our 6-year assessment cycle. This includes the following:

- Program restructuring to facilitate ABET accreditation
- Curricular changes to the CS major and concentrations
- Development of strategic plan, including academic / student success actions

Major and Concentration Restructuring

The previous structure of our program had four concentrations underneath the umbrella of computer science (cybersecurity, data science, high performance computing, and software). Figure 1 shows the

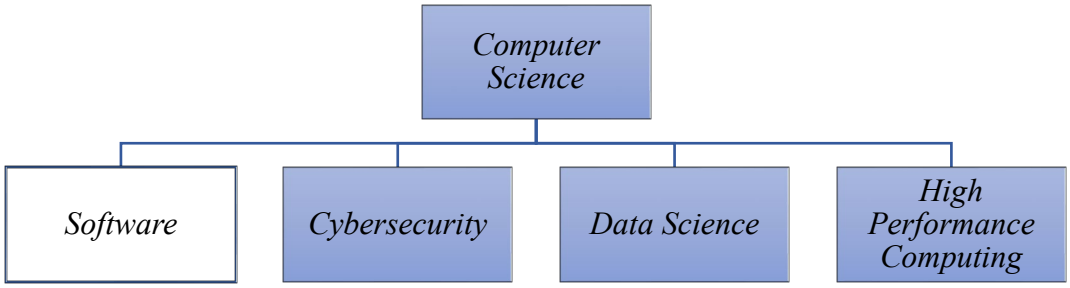

Figure 1 Original Structure

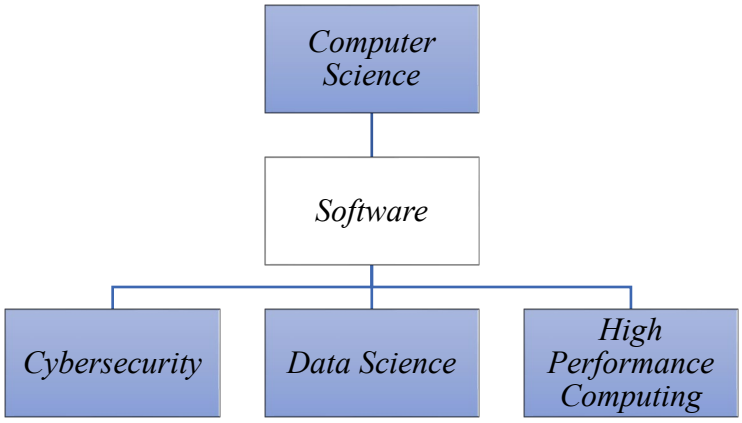

Figure 2 Pathways Under Original Structure

current structure of our concentrations in relation to the named Computer Science program. This structure, however, does not accurately reflect the true design and structure of our program and concentrations. While the other concentrations are all listed as sibling concentrations, the cybersecurity, data science, and high-performance computing concentrations are all subsets of the software concentration. Specifically, these other concentrations are elective pathways through the software concentration, as shown in Figure 2.

Proposed Program Structure

Our original request was to create the structure shown in Figure 3 for our program. Specifically, we wanted to eliminate the software concentration, effectively removing a logical layer in the program. In our current practices, the software concentration was the default program. Students who do not declare a concentration are placed in the software concentration. In this new structure, students would be placed into the Computer Science core major program.

There are a number of benefits to restructuring our program in this fashion. First, and foremost, the structure is consistent with the logical design of the program, with the concentrations consisting of the pathways of completion. A student that does not wish to concentrate in any of the three areas of cybersecurity, data science, or high-performance computing would simply complete the core computer science program. Second, this structure facilitates the ABET accreditation review since the evaluation of the core program would include evaluation of all concentrations, which are simply options through the core program. Previously, only the software concentration was reviewed and accredited. This change also eliminates any confusion for students as they enter the program. Students can simply declare computer science as a major and indicate a concentration only if they so choose.

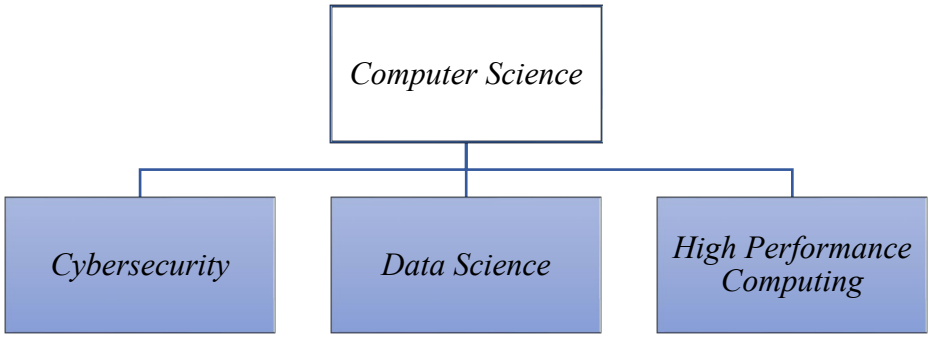

Figure 3 New Structure

Teach-Out Plan

In regards to the implementation of this plan, the transition for students in the software concentration is seamless – no courses will be eliminated or created in order to phase in the change. For the software concentration students, the change is in fact a mere removal of the concentration in their program of study. In the Spring 2020, we envision moving current students with graduation dates later than May 2020 from the "software and scientific applications" concentration into the Computer Science core major (without a concentration). If newly admitted students do not pick another concentration (i.e., cybersecurity, data science, or high-performance computing), they will be admitted into the Computer Science core major.

Summary of Curricular Changes

The following table summarizes the curricular changes that resulted from the analysis of the program by the faculty during the 2020-2021 academic year.

Change (A-add, M-modified, D-deleted)	Associated Outcomes	Rationale
Major and Concentration restructuring	All	The program was restructured (and approved by THEC) to reflect the comprehensive relationship between the major and the different concentrations. The Software and Scientific Applications concentration was removed and all majors in that concentration moved to the CS major proper. All concentrations were relegated to being subsets of the major.
M: CSC 2310 – Added more lectures and activities on user stories	SO 1	2019-2020 identified some issues in the analysis of outcomes regarding the quality of user story development observed in CSC 4610. Change was introduced in Spring 2021 in a lower division feeder course. Fall 2021 will be the first assessment cycle for this change. Programming content was reduced accordingly.
D: CSC 2500 A: CSC 2510	SO 2	Past direct assessments indicated some issues in SO 2. Part of these issues have to do with system configuration and operations-level knowledge. The one credit CSC 2500 is being eliminated in favor of a three-credit CSC 2510 to address this issue. Assessments of CSC 2310, 3300, and 4610 will be performed in the future to measure the effect of this change in the curriculum
A: CSC 2220 (DSAI) A: CSC 2570 (Cyber) A: CSC 2770 (HPC)	SO 1, SO 2, SO 6	Faculty reflections, past direct assessments, feedback from external and student stakeholders all have indicated changes are warranted in response to the constant changes of the industry and discipline. The courses were added to address this concern across all concentrations for the program. A new assessment plan will be developed based on these changes.
DSAI A: CSC 2220 M: CSC 3220 A: CSC 4260	SO 1, SO 2, SO 6	DSAI was updated in order to address comments from faculty, students, employers, and alumni. See attached summary of comments from the strategic planning engagement discussions.
Cyber D: CSC 2560 A: CSC 2570 A: CSC 4585 M: CSC 3570 M: CSC 4570	SO 1, SO 2 SO 6	Cyber was updated in order to address comments from faculty, students, employers, and alumni. See attached summary of comments from the strategic planning engagement discussions.
HPC A: CSC 2770 M: CSC 4770 M: CSC 4780	SO 1, SO 2 SO 6	HPC was updated in order to address comments from faculty, students, employers, and alumni. See attached summary of comments from the strategic planning engagement discussions.
Major and all concentrations: 4 credits of science removed		Our disciplinary accrediting body (ABET Computing Accreditation Commission) published a new set of guidelines regarding the number of science credits required. We have reduced our science credits accordingly to stay within the institutional and ABET CAC guidelines.

M: CSC 4620 – 1 credit removed from course	SO 1, SO 2, SO 6	One credit of CSC 4620 was removed in recognition of content being moved to CSC 2310 and to reflect

Strategic Plan Goals specifically related to the CS BS Program

Motivation: *Students need to be well prepared for careers.*

Goal statement

CS graduates are known as technically proficient and forward-thinking leaders who embrace life-long learning and have a commitment to advancing the profession.

- Technical Proficiency Sub-goal:
  The department will create measurements for tracking the quality of the curriculum improvements that were introduced for Fall 2021.

  Technical Proficiency Objective:
  - The department will introduce 3 measures of teaching excellence.
    - Key Result: The department will launch a peer evaluation methodology to better measure the quality of our teaching
    - Key Result: The department will adapt its ABET assessment activities to evaluate quality of outcomes across more courses
    - Key Result: The department will adapt the pre-post survey approach for measuring course quality
  - Graduates will meet or exceed national norms on the major field test or other state assessment methodology
  - BS Graduates will achieve expected quality measures commensurate with the levels specified in our latest ABET self-study
  - MS Graduates will achieve expected quality measures commensurate with the levels specified in our latest MS THEC self-study

- Experiential Learning Sub-goal:
  The department will be known as the destination for receiving the best in brand experiential learning education.

  Experiential Learning Objectives:
  - By 2025, 40% of our students will be participants in either internships or co-operative education
    - Key Result: Benchmark current situation in the college, the university, and amongst our peers and our aspirational peers.
    - Key Result: Expand the number of companies and industries engaged in internships and cooperative education.
    - Key Result: Set up and track the conversion ratio of full-time job offers from internships.
    - Key Result: Create opportunities for grad students (especially international grad students).
  - By 2025, all of our core (required 8) courses will include industrial engagement

- Key Result: Faculty will identify components of their courses where industrial engagement can be integrated and add value.
- Key Result: Identify key people who can volunteer and be involved in courses.

Appendices

1. Curriculum Map

Appendix 1: Curriculum Map

Computer Science – Student Learning Outcomes and Curriculum Map

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.

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