UNIT REPORT
Computer Science BS - Final Annual Report
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CSC Mission Statement

Start: 07/01/2017

End: 06/30/2018

Reporting Year: 2017-2018

Providing Department: Computer Science BS

Department/Unit Contact: Doug Talbert

Mission/Vision/Goal Statement:

The mission of the Computer Science Department is

"To graduate computer scientists and information technologists who contribute to society, their community, and the world by solving technical challenges with professionalism and creativity."

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 Goal 1: Professionalism

Progress: Ongoing

Define Goal:

Our graduates will exhibit the clear communication, responsible teamwork, commitment to quality, and professional attitudes and ethics needed to engage in successful careers in industry, academia, and public service.

Intended Outcomes / Objectives:

4. Students will demonstrate an ability to function effectively on teams to accomplish a common goal.

5. Students will demonstrate an understanding of professional, ethical, legal, security and social issues and responsibilities.

6. Students will demonstrate an ability to communicate effectively with a range of audiences.

7. Students will demonstrate an ability to analyze the local and global impact of computing on individuals, organizations, and society.

Program Goal 2: Leadership

Progress: Ongoing

Define Goal:

Our graduates will provide technical leadership for their business, profession, and community.

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Intended Outcomes / Objectives:

4. Students will demonstrate an ability to function effectively on teams to accomplish a common goal.

6. Students will demonstrate an ability to communicate effectively with a range of audiences.

10. Students will demonstrate an ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

Program Goal 3: Economic impact

Progress: Ongoing

Define Goal:

Our graduates will enhance the economic well being of the Upper Cumberland and the state of Tennessee and the nation through their technical expertise and leadership.

Intended Outcomes / Objectives:

2. Students will demonstrate an ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.

3. Students will demonstrate an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.

7. Students will demonstrate an ability to analyze the local and global impact of computing on individuals, organizations, and society.

9. Students will demonstrate an ability to use current techniques, skills, and tools necessary for computing practice.

11. Students will demonstrate an ability to apply design and development principles in the construction of software systems of varying complexity.

Program Goal 4: Life-long learning

Progress: Ongoing

Define Goal:

Our graduates will adapt to new technologies, tools and methodologies to maintain their ability to respond to the challenges of a changing environment.

Intended Outcomes / Objectives:

1. Students will demonstrate an ability to apply knowledge of computing and mathematics appropriate to the discipline.

8. Students will demonstrate recognition of the need for and an ability to engage in continuing professional development.

CSC 3040 components

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcomes 5, 6, 7

Type of Tool: Other

Frequency of Assessment: Every spring semester

Rationale:

This course focuses primarily on social and ethical issues relating to the computing field. It also has a significant communication component. Specific assignments and test questions are used for assessment purposes.

CSC 3300 (Database Management Systems) components

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcomes 9 - 11

Type of Tool: Other

Frequency of Assessment: Every fall and spring semester

Rationale:

This senior-level course has a significant implementation component. The course requires students to understand and make use of software design principles. Specific assignments and test questions are used for assessment.

CSC 4100 (Operating Systems) components

Goal/ Outcome/ Objective: Goals 1-4/Learning outcomes 3, 9 - 11

Type of Tool: Other

Frequency of Assessment: Each spring semester

Rationale:

This senior-level course has a significant implementation component. The course requires students to understand and make use of software design principles. Specific assignments and test questions are used for assessment.

California Critical Thinking Skills Test (CCTST)

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcome 2

Type of Tool: Exit Exam

Frequency of Assessment: Each year

Rationale:

The CCTST is based on the Delphi Expert Consensus Definition of Critical Thinking. It is used to predict strength in critical thinking in authentic problem situations and success on professional licensure examinations. We consider it one measure of students' problem analysis/solving ability.

Capstone project external customer reviews

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcomes 2, 3, 5, 6, 9, 11

Type of Tool: Capstone Project

Frequency of Assessment: Every fall and spring semester

Rationale:

This allows us to get direct measures on a number of learning outcomes from an external evaluator. This is an excellent tool because the capstone projects are large-scale, real world, and team-based. There is no other place in the CSSC curriculum that combines such a project experience with an external customer. The software engineering committee summarizes the tool results, and the full faculty and the external advisory board discuss the summary and identify corrective steps (if needed).

Capstone project peer reviews by teammates

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcome 4

Frequency of Assessment: Every fall and spring semester

Rationale:

These are used to evaluate the ability of CSSC students to function effectively as a team. Each student in this course participates as part of a 4- to 5-person team for two semesters. Because of that, it is an ideal time to capture scores for teamwork ability. The software engineering committee summarizes the tool results, and the full faculty and the external advisory board discuss the summary and identify corrective steps (if needed).

ETS Computer Science Major Field Test (CS-MFT)

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcome 1 and 9

Frequency of Assessment: Each fall and spring semester

Rationale:

This standardized test provides direct assessments of programming/software engineering, discrete structures/algorithms, and architecture/OS/networks/databases. Since this test is given to graduating seniors, it is an appropriate tool to measure of student's abilities at the time of graduation. It is a standardized test based on nationally defined expectations for computer science graduates. The department chairperson summaries the results, and the full faculty and the external advisory board discuss the summary and identify corrective steps (if needed).

Faculty Course Surveys

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcomes 1 - 11

Type of Tool: Survey

Frequency of Assessment: Every fall and spring semester

Rationale:

At the end of each semester, we ask faculty to fill out a survey for each courses they taught to indicate how well they believe students achieved attainment on the student outcomes addressed in that course. They also address student preparedness, evaluate changes to course, and suggest future changes.

We are implementing a new type of faculty course reflection. We piloted it in the Spring and will be looking into how it fits into our overall assessment plan this year.

Internship Evaluations

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcomes CSIT 10-14

Type of Tool: Other

Frequency of Assessment: Each semester

Rationale:

These are the CSIT counterparts to the CSSC program's capstone evaluations. It is the best opportunity to get external evaluation of real world, team-based project work. The internship coordinator reviews the performance reports and brings any concerns to the full faculty and the external advisory board to discuss and identify corrective steps (if needed).

Since we no longer off the CSIT program. This assessment is no longer needed.

Recent Alumni Survey

Goal/ Outcome/ Objective: Goals 1-4

Type of Tool: Survey

Frequency of Assessment: Every other year

Rationale:

These are used to assess our program goals since those goals can only be measured after graduation. There are no other mechanisms available to us to measure goal attainment. Survey results and their implications are discussed at faculty meetings and with our department's external advisory board. Both groups contribute to determining which (if any) corrective actions should be taken.

Security modules throughout multiple courses

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcome 5

Type of Tool: Other

Frequency of Assessment: Each fall and spring semeter

Rationale:

These modules have been developed by our faculty under an NSF grant and have been incorporated into a number of upper division required courses to better integrate security education throughout our curriculum. They each include a learning outcome assessment component.

Student Exit Survey

Goal/ Outcome/ Objective: Goals 1-4/Learning Outcomes 1-11

Type of Tool: Survey

Frequency of Assessment: Each fall and spring semester

Rationale:

These surveys provide an opportunity for graduating seniors to reflect on their experiences at TTU and for us to ask several

questions related to student learning outcomes. We must wait until this point to ensure that the student can reflect on all of his or her experiences. The results are summarized, and the full faculty discuss the summary and identify corrective steps (if needed).

3040 Knowledge Area Assessments

Goal/Objective/Outcome Number: Outcomes 5 and 7

Results:

We consider a score of 80 to be satisfactory.

Knowledge assessed	Outcome	2012-13	2013-14	2014-15	2015-16	2017-18
Professional	5	**79.5**	**76.6**	**64.9**	81.6	**74.4**
Ethical	5	**72.1**	85.3	**72.8**	**74.3**	**79.6**
Legal	5	91.4	87.8	**76.3**	86.2	90.2
Security	5	85.9	82.7	**79.2**	92.1	92.1
Social issues and responsibilities	5	**77.9**	**79.8**	**77.9**	84.7	90.8
Local and global impact	7	85.2	91.6	**70.5**	82.1	82.2

CSC 3300 Knowledge Area Assessments

Goal/Objective/Outcome Number: Outcomes 9 - 11

Results:

The desired level of attainment for each assessment is 80%.

Learning outcome	Assessment tool(s)	S13	F13	S14	F14	S15	F15	S16	S18
9	Selected questions on quizzes & homework assignments	86.4	86.32	81.42	75.6	73.6	80.1	73.3	71.7
10	Selected questions on quizzes & homework assignments	78.2	80.04	80.45	73.7	70.9	64.9	69.5	76.1
11	Selected questions on quizzes	86.5	89.53	86.53	73.6	78.3	89.5	74.3	83.5

CSC 4100 Knowledge Area Assessments

Goal/Objective/Outcome Number: Outcomes 3, 9, 10, and 11

Results:

The desired level of attainment for each assessment is 80%.

| Learning outcome	Assessment tool(s)	2012-13	2013-14	2014-15	2015-16	2017-18
3	Selected questions on quizzes	91.4	94.32	87.2	81.3	73.9
9	Selected questions on quizzes & programming assignments	76.7	80.29	77.6	71.6	83.1
10	Selected questions on quizzes	86	80.73	69	73.5	85.5
11	Selected questions on quizzes & programming assignments	93.9	90.01	77.1	72.4	86.8

California Critical Thinking Skills Test (CCTST)

Goal/Objective/Outcome Number: Outcome 2

Results:

The results for the 2017-18 year are not yet available, but the results for the available years is as follows:

	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
TTU CS	24	24.2	25.7	22.8	17.1	18.6	17.6	18.7	18.8	17.3	15.6	15.8
TTU Average	18.6	18.9	18.4	19.4	17.8	17.4	17.9	17.6	17.7	17.3	16.9	16.2
National Ave	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	17.1	17.1	17.1	17.1
Target	19	19	19	19	19	19	19	19	19	19	19	19
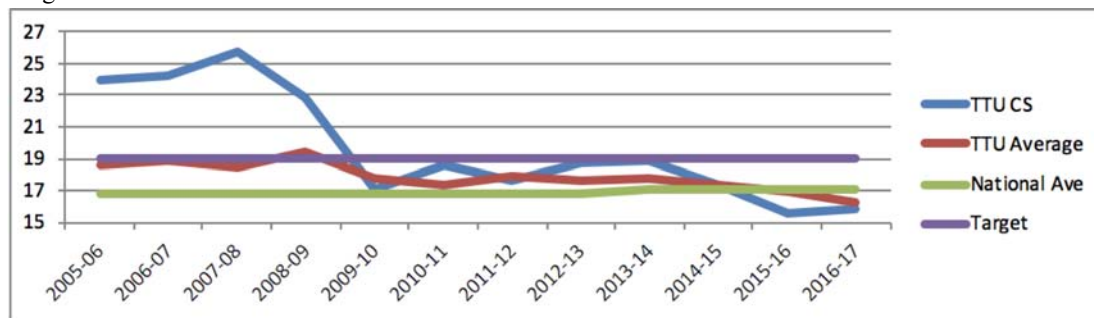
Exit Survey Results

Goal/Objective/Outcome Number: Outcomes 1 - 11

Results:

The desired level of attainment for each assessment is 80%.

Responses from CSSC students

1. Percent rating the program as good or excellent at achieving each CSSC objective

% 'excellent' or 'good'	F12-S14	F13-S15	F14-S16	F15-S17	F16-S18
# of graduates	39	57	51	76	130
# of responses	33	40	27	22	55
outcome 1	90.91%	92.50%	96.30%	95.45%	96.36%
outcome 2	90.91%	95.00%	92.59%	95.45%	92.73%
outcome 3	96.97%	95.00%	96.30%	90.91%	89.09%
outcome 4	81.82%	82.50%	82.76%	83.33%	85.45%
outcome 5	75.76%	82.50%	85.71%	72.00%	72.88%
outcome 6	69.70%	70.00%	66.67%	72.73%	80.00%
outcome 7	73.53%	75.00%	81.48%	77.27%	76.36%
outcome 8	90.91%	95.00%	100.00%	95.45%	87.27%
outcome 9	90.91%	85.00%	88.89%	88.46%	87.10%
outcome 10	87.88%	90.00%	96.15%	95.24%	92.59%
outcome 11	96.97%	92.50%	92.59%	95.45%	92.59%

2. Percent of respondents participating in professional clubs/activities while at TTU

| Semesters	% in professional activities	# of respondents
F12-S14	0.84848	33
F13-S15	0.925	40
F14-S16	0.95122	41
F15-S17	0.86111	36
F16-S18	0.61818	55

Major Field Test

Goal/Objective/Outcome Number: Outcomes 1 and 9

Results:

We consider a score of 80 to be satisfactory.

Cohorts	Programming	OS, Arch, Nets, DB	Math, Alg	Overall
F16 - S18	88.4	96.1	90.6	93.2
F15 - S17	82.6	90.2	90.2	89.4
F14 - S16	**75.8**	80	87.1	82.9
F13 - S15	**79.9**	83.2	82.7	84.7

F12 - S14	87.9	83	82.1	88.5
F11 - S13	93.7	**68.1**	84	85.3
F10 - S12	90.4	**73.6**	83	83.5
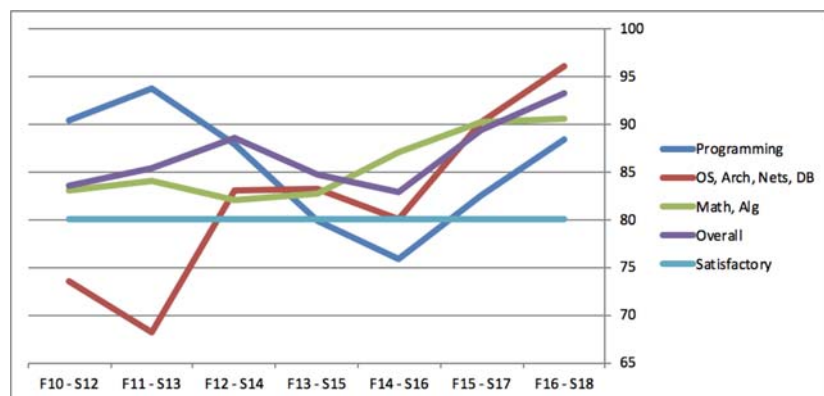
Results from Capstone Courses

Goal/Objective/Outcome Number: Outcomes 2 - 6, 9, and 11

Results:

We have undergone a substantive redesign of the way in which our teams interact with themselves and with customers. We will update these results later this year as the Assessment Committee works with appropriate faculty to map our assessments to the new course design.

Improving Student Attainment in the Area of Critical Thinking Skills

Goal/Objective/Outcome Number: Outcome 4

Program Changes and Actions due to Results:

We will update the results once the 2017-18 results are available, but it seems clear that we have had a historical pattern of critical thinking skills test scores that are below our desired level of attainment. We had assumed this was due to the presence of a large number of students in a now discontinue concentration. That concentration is no longer contributing to our score, so we need to begin addressing this issue this year. The Assessment Committee with work with the Undergraduate Curriculum Committee to identify and implements ways to try to improve student attainment in this area.

Link to Assessment:

This is based on scores from the CCTST exam.

Link to Flight Plan: Other

Work to improve ethical awareness among students

Goal/Objective/Outcome Number: Outcome 5

Program Changes and Actions due to Results:

On average, students do not attain our desired level of awareness on ethics as evidenced by scores in CSC 3040 and students' self assessment on the exit survey. This has been an ongoing problem. The assessment committee will work with the undergraduate curriculum committee to identify ways in which this problem might be addressed.

Link to Assessment:

This need for change was indicated by both scores in CSC 3040 and by student responses on the graduating senior exit survey.

Link to Flight Plan: Improve Undergraduate Student Experience

Improving awareness of assessment mechanisms and needs among faculty

Improvements to Assessment Plan:

As the department has grown and added faculty, we have begun to see changes in which faculty are teaching the courses we rely on for assessment. As new faculty took over these courses, there has been insufficient communication regarding the need and expectations for performing program assessment. Now that we have identified the problem, we are putting practices in place to prevent this from happening in the future.

Measurement and assessment of data from the Capstone courses

Measurement and assessment of data related to security concepts

Improvements to Assessment Plan:

The SecKnitKit grant is over, and faculty are re-evaluating the manner in which security is incorporated and evaluated. The Assessment Committee will work with appropriate faculty to develop a new approach to assessing the level of attainment by students in learning security concepts.

Reassess Value of Recent Alumni Survey

Improvements to Assessment Plan:

We are re-evaluating the utility of our previous surveys and will be make a decision about their future this year.

Redesign faculty course reflections

Improvements to Assessment Plan:

Faculty found the previous course surveys confusing and unhelpful. Based on an approach used successfully at another institution, we are implementing as new approach to faculty course reflections. We need to develop ways to use these reflections to help measure program success.