Institutional Effectiveness Report
2019-20

Program: Computer Science MS

College and Department: College of Engineering – Computer Science

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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:

1. The student should gain breadth of knowledge in the discipline and depth in the specific area of his/her specialization.

2. To establish and foster a culture of curiosity, excitement, collaboration, and engagement in the global research community, with a commitment to quality and academic integrity

Student Learning Outcomes:

1. The student should gain breadth of knowledge in the discipline and depth in the specific area of his/her specialization.

2. The student should demonstrate knowledge of the techniques, methods, and disciplines of computer science research.

3. The student should progress and graduate in a timely fashion.

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

Assessment:

1. *Graduating GPA* - Since our curriculum requires both breadth and depth, we believe a GPA of 3.5 or higher at the time of graduation demonstrates success in these areas. We will track the proportion of students with at least a 3.5 graduating each school year. Our target percentage is at least 70%.

2. *Percent of students graduating with at least one research presentation or peer-reviewed publication* - Research presentations and publications provide evidence of student research and communication skills. For all graduating M.S. students each year, we compute the percent who have demonstrated such evidence. Given the short duration of the degree, we have set our desired level of attainment at 50%.

3. *Time to degree completion -* Timely graduation is important for students and for the responsible use of department resources. Students going beyond 2.5 years for their M.S. should be an exception. Note that we use the 2.5-year measure due to the fact that many graduate students defend late in their intended semester of graduation and will miss the defense deadline for graduation. As such, while a student successfully defends their thesis or project in one semester, they are listed as a graduate of the following semester. Our desired level of attainment is 80% graduating within 2.5 years. We are not including direct-admit PhD students who are also pursuing their M.S. degree because their timeline can be very different.

Results:

SLO 1: The student should gain breadth of knowledge in the discipline and depth in the specific area of his/her specialization.

	2016-17	2017-18	2018-19	2019-20
Number of graduates	6	7	10	16
% with at least 3.5	66.67%	71.43%	100%	93.75%

Over the last three years, we have been able to reach our targeted percentage. While the percentage decreased slightly from the previous year, that is not surprising given that we increased the number of graduates by 60%. For this year, the results are similar to the rest of the College of Engineering:

Major	Number of graduates	% with at least 3.5
Civil Engineering	12	83.33%
Chemical Engineering	3	100%
Electrical and Computer Engineering	3	100%
Mechanical Engineering	9	88.89%

SLO 2: The student should demonstrate knowledge of the techniques, methods, and disciplines of computer science research.

	2016-17	2017-18	2018-19	2019-20
Number of graduates	6	7	10	16
% with publication or presentation	33.33%	57.14%	70%	68.75%

The number of students engaged in publications and/or presentations of conference/journal research papers has grown each year. While the percentage was similar to the previous year, the number of publications actually increased along with the number of graduates. Many of these papers appear as part of participation in sponsored research projects, which comes with an expectation of publishing. In addition, we hired 5 new tenure-track faculty in fall 2019, which also comes with an expectation of publishing – for which graduate students are actively involved.

SLO 3: The student should progress and graduate in a timely fashion completing degree in 2.5 years or less.

	2016-17	2017-18	2018-19	2019-20
Number of graduates	6	7	10	16
% completing degree in 2.5 years or less.	100%	57.1%	100%	87.5%

Since 2016, only 5 of the 39 graduates (13%) were unable to complete the degree in 2.5 years or less. For the 2 students this year that did not graduate in the 2.5-year window, we believe many factors contributed to their inability to complete on time, some of which is out of control of the department (e.g., student working full-time). However, even with a higher number of graduates this year, we were able to meet our percentage expectations.

Modifications for Continuous Improvement

The CSC Department has in place a framework/process for the continual improvement of the MS program to ensure its learning outcomes are met and that the outcomes are themselves updated as necessary to reflect any changes that may occur in vision, mission, or the needs of the profession and research community.

Information that is regularly collected for evaluation of program objectives and learning outcomes were outlined in the previous sections of this report. As responses to the identified results, changes implemented in 2019-2020, or planned for 2020-2021, are as follows.

Regular Course Offerings

In order to help MS student graduates in a timely fashion, we have assembled a three-year course offering schedule. With this plan, students can take a course each semester in their specialization and choose from 5-6 other CS courses for elective options. The graduate seminar and core theory courses are offered yearly to allow students to fulfill those requirements. In addition, the CS Department allows students to take courses from other departments (pursuant to the course being approved by the students' Advisory Committees).

Extracurricular Learning

In order to offer more opportunities outside of the classroom for learning and understanding advanced concepts, this year the Graduate Student Club was officially recognized as a student organization. In addition to social activities, the organization provides a platform for student engagement with research, presentations by fellow graduate students, and guest speakers lecturing on the latest research trends.

Increased Enrollment

As evidenced by the number previously shown, enrollment in our MS program has increased significantly. In order to further increase our enrollments, the department has put additional effort towards increasing the number of qualified Tennessee Tech students enrolled in our MS program. While the Fast-Track program (allowing a student to take courses as an undergraduate for graduate credit) has been in place for several years, we started increasing the program's visibility by holding informational

sessions both in person (2019) and virtual (2020). Our aim next year is to continue holding these information sessions, and improve Fast Track's visibility on social media and departmental web-sites.

Appendices

1. Curriculum Map

Appendix 1: Curriculum Map

Computer Science - Master's Program

Course	Title	Student Outcomes		
		SLO1	SLO2	SLO3
CSC 5100	Operating Systems	X	X	X
CSC 5200	Computer Networks	X	X	X
CSC 5220	Data Mining/Machine Learning	X	X	X
CSC 5240	Artificial Intelligence	X	X	X
CSC 5320	Computer Architecture	X	X	X
CSC 5400	Analysis of Algorithms	X	X	X
CSC 5570	IT Security	X	X	X
CSC 5575	Info Assurance & Cryptography	X	X	X
CSC 5580	Software Reverse Engineering	X	X	X
CSC 5585	Software and Systems Security	X	X	X
CSC 5710	Dsgn/Dev-Human/Web Interface	X	X	X
CSC 5750	Computer Graphics	X	X	X
CSC 5760	Parallel Programming	X	X	X
CSC 5770	Distributed & Cloud Computing	X	X	X
CSC 6220	Data Mining	X	X	X
CSC 6230	Machine Learning	X	X	X
CSC 6240	Math/Theory-Machine Lrning	X	X	X
CSC 6260	Advanced Topics in A.I.	X	X	X
CSC 6300	Web-Based Database Systems	X	X	X
CSC 6320	Adv Computer Architecture	X	X	X
CSC 6400	Internet Algorithms	X	X	X

CSC 6450	Adv Theory of Computation	X	X	X
CSC 6575	Internet Security	X	X	X
CSC 6580	Advanced Reverse Engineering	X	X	X
CSC 6585	Secure Software Development	X	X	X
CSC 6730	Advanced Networking	X	X	X
CSC 6740	Parallel/Distributed Algorithm	X	X	X
CSC 6760	Grid Computing	X	X	X
CSC 6770	Service Oriented Computing	X	X	X
CSC 6780	Distributed Computing	X	X	X
CSC 6910	Computer Science Seminar	X	X	X
CSC 6980	Masters Project	X	X	X
CSC 6990	Research & Thesis	X	X	X