Institutional Effectiveness Report
2018-19

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
Number of graduates	6	7	10
% with at least 3.5	66.67%	71.43%	100%

The department began using this metric in 2016-17 as an indirect measure of student achievement. We have seen some increase in student quality using this measure each year, but while the trend appears to indicate a yearly improvement in student success, the number of students measured is not yet significant enough to make broader quality assessments.

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

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

In 2016-2017, the department began measuring the number of graduates in the MS program that had at least one refereed publication or presentation. The number of students engaged in publication (and in some cases presentation) of refereed research papers appearing in journals and conference proceedings has grown each year. Many of these papers appear as part of participation in sponsored research projects, which comes with an expectation of publishing. Thus, given our recent increase in sponsored research, this growth is to be expected.

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
Number of graduates	6	7	10
% completing degree in 2.5 years or less.	100%	57.1%	100%

Since 2016, only 3 of the 23 graduates (13%) were unable to complete the degree in 2.5 years or less. For those 3 students last year (2017-2018) that did not graduate in the 2.5-year window, we believe many factors contributed to their inability to complete, some of which is out of control of the department. Even with a higher number of graduates this year (2018-2019), we were able to graduate all of them within the 2.5-year window, exceeding our expectations.

Modifications for 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 2018-2019, or planned for 2019-2020, are as follows.

Faculty Communication

In addition to collecting the previously discussed data, starting in 2016, we regularly solicited and collected graduate faculty and graduate committee reflections. This is a qualitative metric involving faculty observation of how well the program is functioning and its ability to meet the needs of students. The graduate faculty and CS Graduate Program Committee regularly communicate about advising challenges and any problems noticed with curriculum, student progress, at-risk students, assistantships and other related funding issues, marketing, and enrollment concerns. Up until this point, this has primarily occurred informally during the academic year. However, to improve this communication and feedback, starting next year (2019-2020), the graduate faculty will discuss program changes and improvements during bi-annual retreats conducted by the department.

Core Offerings

As the MS program evolved from its original focus in Internet-Based Computing to its current alignment with our research programs, the original core theory course, Internet Algorithmics, was being offered less frequently. Through discussions of advising challenges, we identified that students were having difficulty completing their theory requirement. In response, we created two theory options that were better aligned with the program's and the students' needs. These courses are Parallel and Distributed Algorithms and Mathematics and Theory of Machine Learning. Mathematics and Theory of Machine Learning was developed as a special topics course offered in Fall 2018, and has subsequently been approved for a regular course numbered CSC 6240. Initial evaluations of the course have indicated that despite the difficult material, students have found it be a very effective course for understanding the underlying theoretical aspects behind machine learning.

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