Annual Planning and Assessment of *Student Learning Outcomes* Template

Academic Unit: Computer Science
Academic Program: Master of Science in Computer Science
Year of Assessment: Fall-2019
Department Chair: Dr. Ali Sekmen

Program Purpose: The MS in CS Program prepares students for employment in computer science or closely related fields, or to pursue PhD education. Graduates are expected demonstrate professional growth evidenced by measurable development activities and leadership roles.

Student Learning Outcomes	Measurement Tool	Criteria for Success/ Performance Target	Results and Analysis	Use of Results for Improvement
SLO – 1: Students will analyze a complex computing problem and to apply principles of computing to identify solutions in constructing a software system design.	***Thesis Option:*** This outcome is assessed with the Thesis Committee's evaluation of Thesis Proposal for • Analysis of Research Problem (Student's written product indicates use of computing principles relevant to the project topic.) • Identification of Solution for Research Problem (Student's written product indicates use of computing principles to identify potential solutions to the project.) ***Non-Thesis Option:***	***Thesis Option:*** The criteria are that 80% of the students score 3.5/5 or higher in each of these tools: Analysis of Research Problem and Identification of Solution. ***Non-Thesis Option:*** The criteria are that 80% of the students score 70 points or higher in Analysis of Research Problem and Identification of Solution for Research Problem. Benchmark target was established based on historical data of student performance in the program.	***Thesis Option:*** Number of students scoring 3.5/5 or higher • In Fall-2019, the Department did not have any students presenting a Thesis Proposal ***Non-Thesis Option:*** Number of students scoring 70% or higher • 5 out of 6 (83%) for Analysis of Research Problem • 5 out of 6 (83%) for Identification of Solution	SLO-1 was not measurable for thesis option as there were no students presenting in Fall-2019. It was satisfied for non-thesis option. Based on the 2018-19 assessment, an ad hoc committee from the graduate program faculty was formed and investigated the factors for performance on master thesis. The impact of the intervention is not yet determined since there were no students who presented master thesis proposals in Fall-2019. It is noted that the Fall 2019 results found for the non-thesis option the criteria for success was exceeded. Improvements based on the Fall 2019 result analysis: • The ad-hoc thesis committee's initial recommendations (attached) include addressing system analysis in Master Thesis I course instruction time. • The committee is further scheduled to develop a plan for enhancing Master Thesis I course in Spring-2020.

	This outcome is assessed with the following measures from the semester projects in COMP 6400 and COMP 6700 • Analysis of Research Problem (Student's written product indicates use of computing principles relevant to the project topic.) • Identification of Solution for Research Problem (Student's written product indicates use of computing principles to identify potential solutions to the project.)			
SLO – 2: (Cybersecurity and Networking Concentration) Students will design, implement, and evaluate a computing-based solution to meet a given set of computing requirements with the focus of Cybersecurity or Networking.	***Thesis Option:*** This outcome is assessed with the Thesis Committee's evaluation of Master Thesis for • Design of Computing-Based Solution (Student's written product indicates ability to design computing-based solutions.) • Implementation of Design (Student's written product demonstrates an implementation of a computing-based design.) • Evaluation of Solution (Student's written product presents an evaluation of a computing-based software system.) ***Non-Thesis Option:*** This outcome is assessed with the following measures from the semester project in	***Thesis Option:*** The criteria are that 80% of the students score 3.5/5 or higher in each of these tools: Design of Computing-Based Solution, Implementation of Design, and Evaluation of Solution. ***Non-Thesis Option:*** The criteria are that 80% of the students score 70 points or higher in each of these tools: Design of Computing-Based Solution, Implementation of Design, and Evaluation of Solution. Benchmark target was established based on historical data of student performance in the program.	***Thesis Option:*** Number of students scoring 3.5/5 or higher • 2 out of 2 (100%) for Design of Computing-Based Solution • 2 out of 2 (100%) for Implementation of Design • 2 out of 2 (100%) for Evaluation of Solution Overall, 100% of the measures, (6/6) were higher than 3.5/5. The criteria for SLO-2 are met. ***Non-Thesis Option:*** Number of students scoring 70% or higher • COMP 6700 is offered in spring semesters and it was not offered in Fall-2019.	SLO-2 was satisfied for both thesis and non-thesis options. Based on the 2018-19 assessment, a faculty member was tasked to identify technical writing resources to be presented to the students in COMP 5920 for Fall-2019. The course instructor spent a session going over how to document design, implementation, and evaluation for the thesis. The impact was successful in improving student learning. Improvements based on the Fall 2019 result analysis: • An ad-hoc committee from the graduate program faculty was formed to investigate the process of assessing student learning outcomes for the non-thesis option.

	COMP 6700 Network Programming and Computing. • Design of Computing-Based Solution (Student's written product indicates ability to design computing-based solutions.) • Implementation of Design (Student's written product demonstrates an implementation of a computing-based design.) • Evaluation of Solution (Student's written product presents an evaluation of a computing-based software system.)			
SLO – 3: (HPC and Bioinformatics Concentration) Students will design, implement, and evaluate a computing-based solution to meet a given set of computing requirements with the focus of High-Performance Computing or Bioinformatics.	***Thesis Option:*** This outcome is assessed with the Thesis Committee's evaluation of Master Thesis for • Design of Computing-Based Solution (Student's written product indicates ability to design computing-based solutions.) • Implementation of Design (Student's written product demonstrates an implementation of a computing-based design.) • Evaluation of Solution (Student's written product presents an evaluation of a computing-based software system.) ***Non-Thesis Option:*** This outcome is assessed with the following measures from the semester project in	***Thesis Option:*** The criteria are that 80% of the students score 3.5/5 or higher in each of these tools: Design of Computing-Based Solution, Implementation of Design, and Evaluation of Solution. ***Non-Thesis Option:*** The criteria are that 80% of the students score 70 points or higher in each of these tools: Design of Computing-Based Solution, Implementation of Design, and Evaluation of Solution. Benchmark target was established based on historical data of student performance in the program.	***Thesis Option:*** Number of students scoring 3.5/5 or higher • 1 out of 1 (100%) for Design of Computing-Based Solution • 1 out of 1 (100%) for Implementation of Design • 1 out of 1 (100%) for Evaluation of Solution Overall, 100% of the measures, (6/6) were higher than 3.5/5. The criteria for SLO-2 are met. ***Non-Thesis Option:*** Number of students scoring 70% or higher • 5 out of 6 (83%) for Design of Computing-Based Solution • 5 out of 6 (83%) for Implementation of Design • 5 out of 6 (83%) for Evaluation of Solution	SLO-3 was satisfied for both thesis and non-thesis options. Based on the 2018-19 assessment, a proposal for a new graduate concentration called "Data Science" has been developed and submitted for approval. The impact on student learning is yet to be determined. However, the proposal is approved by the Department and College. It is currently under review in Academic Affairs. Please refer to the attached proposal for more details. Improvements based on the Fall 2019 result analysis: • An ad-hoc committee from the graduate program faculty was formed to investigate the process of assessing student learning outcomes for the non-thesis option.

	COMP 6400 Distributed Design and Data Analysis. • Design of Computing-Based Solution (Student's written product indicates ability to design computing-based solutions.) • Implementation of Design (Student's written product demonstrates an implementation of a computing-based design.) • Evaluation of Solution (Student's written product presents an evaluation of a computing-based software system.)			
SLO – 4: Student will convey a computational problem and its solution to an audience of computing professionals.	***Thesis Option:*** This outcome is assessed with the Thesis Committee's evaluation of Thesis Proposal and Master Thesis for Communication via • Written Proposal (Student's written product conveys a computational problem to an audience of computing professionals.) • Written Thesis (Student's written product conveys a computational system development to an audience of computing professionals.) • Proposal Defense (Student's oral product conveys a computational problem to an audience of computing professionals.) • Thesis Defense (Student's oral product conveys a computational system development to an	***Thesis Option:*** The criteria are that 80% of the students score 3.5/5 or higher in each of these tools: Communication via Written Proposal, Written Thesis, Proposal Defense, and Thesis Defense ***Non-Thesis Option:*** The criteria are that 80% of the students score 70 points or higher in each of these tools: Project Presentation and Project report	***Thesis Option:*** Number of students scoring 3.5/5 or higher • No students for Written Proposal • 3 out of 3 (100%) for Written Thesis • No students for Proposal Defense • 3 out of 3 (100%) for Thesis Defense Overall, 100% of the measures, (12/12) were higher than 3.5/5. The criteria for SLO-4 are met. ***Non-Thesis Option:*** Number of students scoring 70% or higher • 5 out of 6 (83%) for Project Presentation • 5 out of 6 (83%) for Project Report	SLO-4 was satisfied for both thesis and non-thesis options. • An ad-hoc committee from the graduate program faculty was formed to investigate the factors for performance on master theses in Fall-2019. • The ad-hoc thesis committee's initial recommendations (attached) include technical communication skills in Master Thesis I and Master Thesis II courses. • The committee is further scheduled to develop a plan for enhancing Master Thesis I and Master Thesis II courses, including technical writing and presentation resources, in Spring-2020 .

	audience of computing professionals.) ***Non-Thesis Option:*** This outcome is assessed with the following measures from the semester projects in COMP 6400 and COMP 6700 • Project Presentation (Student's oral product conveys a computational problem and its solution to an audience of computing professionals.) • Project Report (Student's written product conveys a computational problem and its solution to an audience of computing professionals.)			

MS in Computer Science

	SLO 1. Students will be able to analyze a complex computing problem and to apply principles of computing to identify solutions in constructing a software system design.	SLO 2. **(Cybersecurity and Networking Concentration)** Students will be able to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements with the focus of Cybersecurity or Networking.	SLO 3. **(HPC and Bioinformatics Concentration)** Students will be able to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements with the focus of High-Performance Computing or Bioinformatics.
COMP 5100 Software Engineering	I	I	I
COMP 5200 Advanced Algorithms Design and Analysis	I	I	
COMP 5300 Advanced Computer Architectures	I	I	I
COMP 5700 Fundamentals of Computer Networks	R	R	
COMP 5720 Cryptography and Computer Security	R	R	
COMP 5750 Computer Network Management and Security	R	R	R
COMP 6700 Network Programming	R	R	
COMP 5520 Introduction to High Performance Computing	R	R	I
COMP 5800 Introduction to Bioinformatics	I		
COMP 6100 Bioinformatics and Computational Biology	R		
COMP 6400 Distributed Algorithm Design and Data Analysis	R	R	R
COMP 5910 Master Thesis I	M, A	M, A	M, A
COMP 5920 Master Thesis II	M, A	M, A	M, A

ASSESSMENT RESULTS

AY 2018 / ASSESSMENT & IMPROVEMENT PLAN

Analysis and Identification of Solutions

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Plan Item was last modified on 7/31/19, 10:29 AM
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Template:

Student Learning Outcome (2015-2020)

Student Learning Outcome Name:

Analysis and Identification of Solutions

LO Number:

106-003.2-LO-01

Start:

7/1/2015

End:

6/30/2020

Progress:

Ongoing

Providing Department:

003 Computer Science (MS)

Responsible Roles:

Ali Sekmen (asekmen)

SECTION 1:

1. DEFINE LEARNING OUTCOME

1.1 Intended Outcome:

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

1.2 Criteria for Success:

For Thesis Option

(1) 75% of the students successfully defend their Thesis Proposal in first time taking COMP 5910.

(2) 75% of the students successfully defend their Master Thesis in first or second time taking COMP 5920.

For Non-Thesis Option

(1) 75% of the students successfully complete their 6 credit hours of design based courses with a minimum of B grade.

Frequency/Cycle of Measurement:

Annually

1.3 Means of measurement/assessment:

The MS in Computer Science Program offers thesis and non-thesis options. The program requires completion of either a 6-credit hour thesis (Master Thesis-I and Master Thesis-II), for the thesis option, or 6 credit hours of design-based courses, for the non-thesis option, in addition to 27 credit hours of concentration-specific coursework.

For thesis option, a thesis manuscript and an oral presentation are required to document the student's research activity. A thesis committee supervises the student's thesis work. In Master Thesis-I, the student is required to provide a Thesis Proposal to the committee. The Thesis Proposal provides comprehensive analysis of problem and identification of solutions as well as partial development and verification of the proposed solutions. COMP 5910 Master Thesis I requires completion of a Thesis Proposal Report and its successful defense. In Master Thesis-II, the student is required to provide a Master Thesis Manuscript that includes

comprehensive analysis, development, and verification of a computing system, COMP 5920 Master Thesis II requires completion of Master Thesis and its successful defense. Therefore, *Thesis Proposal Report, Thesis Proposal Defense, Master Thesis Report,* and *Master Thesis Defense* are used as means of measurement/assessment.

For non-thesis option, the student is required to take a minimum of 6 credit hours of design-based courses from a pool of courses determined by the Computer Science Graduate Faculty. Each design-based course requires a course project with problem analysis, identification of solution, system design, and verification. Therefore, *design-based coursework* are used as means of measurement/assessment.

Attached Files
There are no attachments.

SECTION 2:

REPORT RESULTS

2.1 Reporting data (2015-2016):

The MS in CS Program started in Fall-2014. Therefore, the 2015-2016 academic year was our first year to have some partial data to report.

For Thesis Option

	Spring-2015		Fall-2015		Spring-2016	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass	1st Attempt	Pass
	1	1	3	3	2	2
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass	1st Attempt	Pass
	-	-	1	0	3	1
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass	2nd Attempt	Pass
	-	-	1	1	1	1

For Non-Thesis Option

In Fall-2015 and Spring-2016, there were 17 students taking 3-credit design based courses. All of the students passed their courses with either B or A grades.

Attached Files
There are no attachments.

2.2 Analyzing progress (2015-2016):

For Thesis Option

- 100% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 100% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-1 was satisfied.

For Non-Thesis Option

- 100% of the students completed their design-based courses successfully in Fall-2015 and Spring-2016.
- LO-1 was satisfied.

2.3 *Criteria met? (2015-2016)*:

MET,

2.1 Reporting data (2016-2017):

For Thesis Option

	Fall-2016		Spring-2017	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	1	1
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	1	1
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass
	2	1	2	1

For Non-Thesis Option

In Fall-2016 and Spring-2017, there were 13 students taking 3-credit design based courses. All of the students passed their courses with either B or A grades.

Attached Files
There are no attachments.

2.2 Analyzing progress (2016-2017):

For Thesis Option

- 100% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 66.7% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-1 was partially satisfied. All of the Thesis Proposals were successfully defended, however, 2 out of 6 students were delayed in defending their Master Theses. Since the number of data points is low, this progress must be monitored with larger numbers in the upcoming academic year.

For Non-Thesis Option

- 100% of the students completed their design-based courses successfully in Fall-2016 and Spring-2017.
- LO-1 was satisfied.

Attached Files
There are no attachments.

2.3 *Criteria met? (2016-2017)*:

MET,

2.1 Reporting Data (2017-2018):

For Non-Thesis Option

In Fall-2017 and Spring-2018, there were 20 students taking 3-credit design based courses. All of the students passed their courses with either B or A grades.

For Thesis Option

Attached Files
There are no attachments.

2.2 Analyzing progress (2017-2018):

For Thesis Option

	Fall-2017		Spring-2018	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass
	3	3	4	4
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	3	-
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass
	-	-	-	-

- 100% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 100% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-1 was satisfied.

For Non-Thesis Option

- 100% of the students completed their design-based courses successfully in Fall-2017 and Spring-2018.
- LO-1 was satisfied.

Attached Files
There are no attachments.

***2.3 Criteria met? (2017-2018)*:**

MET,

2.1 Reporting Data 2018-2019:

For Thesis Option

	Fall-2018		Spring-2019	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	4	3
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	3	1
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass
	3	2	1	0

For Non-Thesis Option

In Fall-2018 and Spring-2019, there were 25 design based courses taken by the students. There were 23 "A or B' grades, 1 'C' grade, and 1 'F' grades.

Attached Files
There are no attachments.

2.2 Analyzing Progress (2018-2019):

For Thesis Option

- 80% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 50% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-1 was partially satisfied.

For Non-Thesis Option

- 92% of the students completed their design-based courses successfully in Fall-2017 and Spring-2018.
- LO-1 was satisfied.

Attached Files
There are no attachments.

2.3 *Criteria Met? (2018-2019)*:

MET,

SECTION 3:

PLAN FOR IMPROVEMENT

3.1 Action plan(s):

ACTION PLAN - 1

Action: *Develop a 4+1 Degree Program (Accelerated MS in Computer Science Program).* This program specifically targets at the undergraduate students majoring in Computer Science at TSU. It gives them an opportunity to complete Master of Science in Computer Science degree program within two semesters upon completion of their Bachelor of Science in Computer Science degree program. The program provides our students majoring in the BS in CS program an opportunity to complete their Master's degrees in shorter time so that they enhance their careers and work on cutting-edge areas of computer science.

Proposal Date: Spring-2018

Target Date: Fall-2018

Actual Date: Fall-2018

Responsible Person: Dr. Ali Sekmen, Dr. Kamal Al Nasr, Dr. Tamara Rogers, and Dr. Wei Chen

Completed: Yes

Rationale: This action item was initiated by the CS Department Chair, who also teaches Senior Project I and II courses. The Chair discussed this concept (due to high demand, especially from senior CS majors) at multiple departmental meetings and the CS faculty unanimously approved development of Accelerated MS in Computer Science program. It was extensively discussed in the Dean's Leadership Council and supported by the other department chairs in the College. This program was developed as a team by all graduate faculty in the Department.

Impact: Our Accelerated MS in Computer Science Program has been widely demanded by the CS majors at TSU. This program had seven students admitted in Fall-2018 and six students admitted in Spring-2019. Two students completed their BS and MS degrees as of Summer-2019 as graduates of the Accelerated MS in CS Program. Our program is examined by other departments at TSU as a successfully first pilot program of its kind in the University.

ACTION PLAN - 2

Action: *Increase research grants funding to support more students for thesis option.* All computer science faculty are asked to pursue more funded research opportunities.
Proposal Date: Fall-2015
Target Date: On Going
Actual Date: On Going
Responsible Person: All graduate faculty
Completed: On Going (the CS faculty has about $2.3M active research grants in 2018-2019 Academic Year).
Rationale: This action item was initiated by the Department Chair, who also teaches COMP 5900 Master Thesis I and COMP 5910 Master Thesis II courses. Based on the number of students preferring thesis option over non-thesis option, the Chair requested that more faculty pursues research grants. This was discussed in multiple departmental meetings and supported by all faculty.
Impact: The number of students supported by research has increased over the years. For example, one faculty member supported 11 graduate and undergraduate students from his research grants in Spring-2019.

ACTION PLAN - 3

Action: *Develop a new course titled COMP 6400 Distributed Algorithm Design and Data Analysis.* This course is a project-based course with hands-on experience on distributed computing.
Proposal Date: Fall-2015
Target Date: Fall-2016
Actual Date: Fall-2016
Responsible Person: Dr. Kamal Al Nasr and Dr. Matthew Hayes
Completed: Yes
Rationale: This action item was initiated by the graduate faculty in High-Performance Computing and Bioinformatics concentration. It was extensively discussed in Department Curriculum Committee (e.g. Nov16, 2016 meeting) and approved. It was also discussed by the entire faculty in a departmental meeting.

ACTION PLAN - 4

Action: *Develop a new course titled COMP 6700 Network Programming and Computing.*
Proposal Date: Fall-2015
Target Date: Fall-2016
Actual Date: Fall-2016
Responsible Person: Dr. Erdem Erdemir and Dr. Wei Chen
Completed: Yes
Rationale: This action item was initiated by the graduate faculty in Cyrer-Security and Networking concentration. It was extensively discussed in Department Curriculum Committee (e.g. Nov16, 2016 meeting) and approved. It was also discussed by the entire faculty in a departmental meeting.

ACTION PLAN - 5

Action: *Utilize the Bioinformatics Laboratory in TIGER Institute for providing more hands-on opportunities for COMP 5800 Introduction to Bioinformatics and COMP 6100 Bioinformatics and Computational Biology courses.*
Proposal Date: Fall-2015
Target Date: Fall-2016
Actual Date: Fall-2017
Responsible Person: Dr. Kamal Al Nasr and Dr. Matthew Hayes
Completed: Yes
Rationale: This action item was initiated by the graduate faculty in High-Performance Computing and Bioinformatics concentration. It was strongly supported by the Department Chair. It was also discussed by the entire faculty in a departmental meeting.
Impact: The number of students using TIGER Institute research facility increased. It provides an environment for our students to collaborate in research.

Attached Files

Agenda - Department Meeting 3-7-18

Agenda - Department Meeting 4-6-18

Minutes - Curriculum Committee Meeting 11-29-16

Minutes - Graduate Faculty Meeting Minutes 10-9-17

3.2 Documentation:

Linked Documents
There are no attachments.

Attached Files
There are no attachments.

Related Items

Supports *(Connected Up):*

Scholarly Inquiry [Instruction]
000 Institution University Mission

Student Success and Customer Service
000 Institution TSU 2020 Strategic Plan

Supported By *(Connected Down):*

No supported by items currently associated

AY 2018 / ASSESSMENT & IMPROVEMENT PLAN

Develop and Verify Computing Systems

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Template:

Student Learning Outcome (2015-2020)

Student Learning Outcome Name:

Develop and Verify Computing Systems

LO Number:

106-003.2-LO-02

Start:

7/1/2015

End:

6/30/2020

Progress:

Ongoing

Providing Department:

003 Computer Science (MS)

Responsible Roles:

Ali Sekmen (asekmen)

SECTION 1:

1. DEFINE LEARNING OUTCOME

1.1 Intended Outcome:

Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements with the focus of their concentrations.

1.2 Criteria for Success:

For Thesis Option

(1) 75% of the students successfully defend their Thesis Proposal in first time taking COMP 5910.

(2) 75% of the students successfully defend their master Thesis in first or second time taking COMP 5920.

For Non-Thesis Option

(1) 75% of the students successfully complete their 6 credit hours of design based courses with a minimum of B grade.

Frequency/Cycle of Measurement:

Annually

1.3 Means of measurement/assessment:

The MS in Computer Science Program offers thesis and non-thesis options. The program requires completion of either a 6-credit hour thesis (Master Thesis-I and Master Thesis-II), for the thesis option, or 6 credit hours of design-based courses, for the non-thesis option, in addition to 27 credit hours of concentration-specific coursework.

For thesis option, a thesis manuscript and an oral presentation are required to document the student's research activity. A thesis committee supervises the student's thesis work. In Master Thesis-I, the student is required to provide a Thesis Proposal to the committee. The Thesis Proposal provides comprehensive analysis of problem and identification of solutions as well as partial development and verification of the proposed solutions. COMP 5910 Master Thesis I requires completion of a Thesis Proposal

Report and its successful defense. In Master Thesis-II, the student is required to provide a Master Thesis Manuscript that includes comprehensive analysis, development, and verification of a computing system, COMP 5920 Master Thesis II requires completion of Master Thesis and its successful defense. Therefore, Thesis Proposal Report, Thesis Proposal Defense, Master Thesis Report, and Master Thesis Defense are used as means of measurement/assessment.

For non-thesis option, the student is required to take a minimum of 6 credit hours of design-based courses from a pool of courses determined by the Computer Science Graduate Faculty. Each design-based course requires a course project with problem analysis, identification of solution, system design, and verification. Therefore, design-based coursework are used as means of measurement/assessment.

Attached Files
There are no attachments.

SECTION 2:

REPORT RESULTS

2.1 Reporting data (2015-2016):

The MS in CS Program started in Fall-2014. Therefore, the 2015-2016 academic year was our first year to have some partial data to report.

For Thesis Option

	Spring-2015		Fall-2015		Spring-2016	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass	1st Attempt	Pass
	1	1	3	3	2	2
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass	1st Attempt	Pass
	-	-	1	0	3	1
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass	2nd Attempt	Pass
	-	-	1	1	1	1

For Non-Thesis Option

In Fall-2015 and Spring-2016, there were 17 students taking 3-credit design based courses. All of the students passed their courses with either B or A grades.

Attached Files
There are no attachments.

2.2 Analyzing progress (2015-2016):

For Thesis Option

- 100% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 100% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-2 was satisfied.

For Non-Thesis Option

- 100% of the students completed their design-based courses successfully in Fall-2015 and Spring-2016.
- LO-2 was satisfied.

2.3 *Criteria met? (2015-2016)*:

MET,

2.1 Reporting data (2016-2017):

For Thesis Option

	Fall-2016		Spring-2017	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	1	1
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	1	1
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass
	2	1	2	1

For Non-Thesis Option

In Fall-2016 and Spring-2017, there were 13 students taking 3-credit design based courses. All of the students passed their courses with either B or A grades.

Attached Files
There are no attachments.

2.2 Analyzing progress (2016-2017):

For Thesis Option

- 100% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 66.7% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-2 was partially satisfied.

For Non-Thesis Option

- 100% of the students completed their design-based courses successfully in Fall-2016 and Spring-2017.
- LO-2 was satisfied.

Attached Files
There are no attachments.

2.3 *Criteria met? (2016-2017)*:

MET,

2.1 Reporting Data (2017-2018):

For Thesis Option

For Non-Thesis Option

In Fall-2017 and Spring-2018, there were 20 students taking 3-credit design based courses. All of the students passed their courses with either B or A grades.

Attached Files
There are no attachments.

2.2 Analyzing progress (2017-2018):

For Thesis Option

	Fall-2017		Spring-2018	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass
	3	3	4	4
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	3	-
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass
	-	-	-	-

- 100% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 100% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-2 was satisfied.

For Non-Thesis Option

- 100% of the students completed their design-based courses successfully in Fall-2017 and Spring-2018.
- LO-2 was satisfied.

Attached Files
There are no attachments.

***2.3 Criteria met? (2017-2018)*:**

MET,

2.1 Reporting Data 2018-2019:

For Thesis Option

	Fall-2018		Spring-2019	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	4	3
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	3	1
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass
	3	2	1	0

For Non-Thesis Option

In Fall-2018 and Spring-2019, there were 25 design based courses taken by the students. There were 23 "A or B' grades, 1 'C' grade, and 1 'F' grades.

Attached Files
There are no attachments.

2.2 Analyzing Progress (2018-2019):

For Thesis Option

- 80% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 50% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-2 was partially satisfied.

For Non-Thesis Option

- 92% of the students completed their design-based courses successfully in Fall-2017 and Spring-2018.
- LO-2 was satisfied.

Attached Files
There are no attachments.

2.3 *Criteria Met? (2018-2019)*:

MET,

SECTION 3:

PLAN FOR IMPROVEMENT

3.1 Action plan(s):

ACTION PLAN - 1

Action: *Develop a 4+1 Degree Program (Accelerated MS in Computer Science Program).* This program specifically targets at the undergraduate students majoring in Computer Science at TSU. It gives them an opportunity to complete Master of Science in Computer Science degree program within two semesters upon completion of their Bachelor of Science in Computer Science degree program. The program provides our students majoring in the BS in CS program an opportunity to complete their Master's degrees in shorter time so that they enhance their careers and work on cutting-edge areas of computer science.

Proposal Date: Spring-2018

Target Date: Fall-2018

Actual Date: Fall-2018

Responsible Person: Dr. Ali Sekmen, Dr. Kamal Al Nasr, Dr. Tamara Rogers, and Dr. Wei Chen

Completed: Yes

Rationale: This action item was initiated by the CS Department Chair, who also teaches Senior Project I and II courses. The Chair discussed this concept (due to high demand, especially from senior CS majors) at multiple departmental meetings and the CS faculty unanimously approved development of Accelerated MS in Computer Science program. It was extensively discussed in the Dean's Leadership Council and supported by the other department chairs in the College. This program was developed as a team by all graduate faculty in the Department.

Impact: Our Accelerated MS in Computer Science Program has been widely demanded by the CS majors at TSU. This program had seven students admitted in Fall-2018 and six students admitted in Spring-2019. Two students completed their BS and MS degrees as of Summer-2019 as graduates of the Accelerated MS in CS Program. Our program is examined by other departments at TSU as a successfully first pilot program of its kind in the University.

ACTION PLAN - 2

Action: *Increase research grants funding to support more students for thesis option.* All computer science faculty are asked to pursue more funded research opportunities.
Proposal Date: Fall-2015
Target Date: On Going
Actual Date: On Going
Responsible Person: All graduate faculty
Completed: On Going (the CS faculty has about $2.3M active research grants in 2018-2019 Academic Year).
Rationale: This action item was initiated by the Department Chair, who also teaches COMP 5900 Master Thesis I and COMP 5910 Master Thesis II courses. Based on the number of students preferring thesis option over non-thesis option, the Chair requested that more faculty pursues research grants. This was discussed in multiple departmental meetings and supported by all faculty.
Impact: The number of students supported by research has increased over the years. For example, one faculty member supported 11 graduate and undergraduate students from his research grants in Spring-2019.

ACTION PLAN - 3

Action: *Develop a new course titled COMP 6400 Distributed Algorithm Design and Data Analysis.* This course is a project-based course with hands-on experience on distributed computing.
Proposal Date: Fall-2015
Target Date: Fall-2016
Actual Date: Fall-2016
Responsible Person: Dr. Kamal Al Nasr and Dr. Matthew Hayes
Completed: Yes
Rationale: This action item was initiated by the graduate faculty in High-Performance Computing and Bioinformatics concentration. It was extensively discussed in Department Curriculum Committee (e.g. Nov16, 2016 meeting) and approved. It was also discussed by the entire faculty in a departmental meeting.

ACTION PLAN - 4

Action: *Develop a new course titled COMP 6700 Network Programming and Computing.*
Proposal Date: Fall-2015
Target Date: Fall-2016
Actual Date: Fall-2016
Responsible Person: Dr. Erdem Erdemir and Dr. Wei Chen
Completed: Yes
Rationale: This action item was initiated by the graduate faculty in Cyrer-Security and Networking concentration. It was extensively discussed in Department Curriculum Committee (e.g. Nov16, 2016 meeting) and approved. It was also discussed by the entire faculty in a departmental meeting.

ACTION PLAN - 5

Action: *Utilize the Bioinformatics Laboratory in TIGER Institute for providing more hands-on opportunities for COMP 5800 Introduction to Bioinformatics and COMP 6100 Bioinformatics and Computational Biology courses.*
Proposal Date: Fall-2015
Target Date: Fall-2016
Actual Date: Fall-2017
Responsible Person: Dr. Kamal Al Nasr and Dr. Matthew Hayes
Completed: Yes
Rationale: This action item was initiated by the graduate faculty in High-Performance Computing and Bioinformatics concentration. It was strongly supported by the Department Chair. It was also discussed by the entire faculty in a departmental meeting.
Impact: The number of students using TIGER Institute research facility increased. It provides an environment for our students to collaborate in research.

Attached Files

Agenda - Department Meeting 3-7-18

Agenda - Department Meeting 4-6-18

Minutes - Curriculum Committee Meeting 11-29-16

Minutes - Graduate Faculty Meeting Minutes 10-9-17

3.2 Documentation:

Linked Documents
There are no attachments.

Attached Files
There are no attachments.

Related Items

Supports *(Connected Up):*

Scholarly Inquiry [Instruction]
000 Institution University Mission

Student Success and Customer Service
000 Institution TSU 2020 Strategic Plan

Supported By *(Connected Down):*

No supported by items currently associated

AY 2018 / ASSESSMENT & IMPROVEMENT PLAN

Professional Communication

This view always presents the most current state of the plan item.
Plan Item was last modified on 7/31/19, 10:30 AM
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Template:

Student Learning Outcome (2015-2020)

Student Learning Outcome Name:

Professional Communication

LO Number:

106-003.2-LO-03

Start:

7/1/2015

End:

6/30/2020

Progress:

Ongoing

Providing Department:

003 Computer Science (MS)

Responsible Roles:

Ali Sekmen (asekmen)

SECTION 1:

1.1 Intended Outcome:

Communicate effectively in a variety of professional contexts.

1.2 Criteria for Success:

For Thesis Option

(1) 75% of the students successfully defend their Thesis Proposal in first time taking COMP 5910.

(2) 75% of the students successfully defend their master Thesis in first or second time taking COMP 5920.

For Non-Thesis Option

(1) 75% of the students successfully complete their 6 credit hours of design based courses with a minimum of B grade.

Frequency/Cycle of Measurement:

Annually

1.3 Means of measurement/assessment:

The MS in Computer Science Program offers thesis and non-thesis options. The program requires completion of either a 6-credit hour thesis (Master Thesis-I and Master Thesis-II), for the thesis option, or 6 credit hours of design-based courses, for the non-thesis option, in addition to 27 credit hours of concentration-specific coursework.

For thesis option, a thesis manuscript and an oral presentation are required to document the student's research activity. A thesis committee supervises the student's thesis work. In Master Thesis-I, the student is required to provide an oral presentation (of Thesis Proposal) to the committee. In Master Thesis-II, the student is required to provide a Master Thesis Manuscript that includes comprehensive analysis, development, and verification of a computing system, COMP 5920 Master Thesis II requires completion of Master Thesis and its successful oral defense. Therefore, Thesis Proposal Defense (with oral presentation), and Master Thesis Defense (with oral presentation) are used as means of measurement/assessment.

For non-thesis option, the student is required to take a minimum of 6 credit hours of design-based courses from a pool of courses determined by the Computer Science Graduate Faculty. Each design-based course requires a class project with problem analysis, identification of solution, system design, and verification. Most of those courses also require a successful oral presentation of the class projects. Therefore, design-based coursework are used as means of measurement/assessment.

Attached Files
There are no attachments.

SECTION 2:

2.1 Reporting data (2015-2016):

The MS in CS Program started in Fall-2014. Therefore, the 2015-2016 academic year was our first year to have some partial data to report.

For Thesis Option

	Spring-2015		Fall-2015		Spring-2016	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass	1st Attempt	Pass
	1	1	3	3	2	2
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass	1st Attempt	Pass
	-	-	1	0	3	1
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass	2nd Attempt	Pass
	-	-	1	1	1	1

For Non-Thesis Option

In Fall-2015 and Spring-2016, there were 17 students taking 3-credit design based courses. All of the students passed their courses with either B or A grades.

Attached Files
There are no attachments.

2.2 Analyzing progress (2015-2016):

For Thesis Option

- 100% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 100% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-3 was satisfied.

For Non-Thesis Option

- 100% of the students completed their design-based courses successfully in Fall-2015 and Spring-2016.
- LO-1 was satisfied.

2.3 *Criteria met? (2015-2016)*:

2.1 Reporting data (2016-2017):

For Non-Thesis Option

In Fall-2016 and Spring-2017, there were 13 students taking 3-credit design based courses. All of the students passed their courses with either B or A grades.

For Thesis Option

	Fall-2016		Spring-2017	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	1	1
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	1	1
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass
	2	1	2	1

Attached Files
There are no attachments.

2.2 Analyzing progress (2016-2017):

For Thesis Option

- 100% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 66.7% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-3 was partially satisfied.

For Non-Thesis Option

- 100% of the students completed their design-based courses successfully in Fall-2016 and Spring-2017.
- LO-3 was satisfied.

Attached Files
There are no attachments.

2.3 *Criteria met? (2016-2017)*:

2.1 Reporting Data (2017-2018):

For Non-Thesis Option

In Fall-2017 and Spring-2018, there were 20 students taking 3-credit design based courses. All of the students passed their courses with either B or A grades.

For Thesis Option

	Fall-2017		Spring-2018	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass
	3	3	4	4
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	3	-
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass
	-	-	-	-

Attached Files
There are no attachments.

2.2 Analyzing progress (2017-2018):

For Thesis Option

- 100% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 100% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-3 was satisfied.

For Non-Thesis Option

- 100% of the students completed their design-based courses successfully in Fall-2017 and Spring-2018.
- LO-3 was satisfied.

Attached Files
There are no attachments.

2.3 Criteria met? (2017-2018):

2.1 Reporting Data 2018-2019:

For Thesis Option

	Fall-2018		Spring-2019	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	4	3
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	3	1
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass
	3	2	1	0

For Non-Thesis Option

In Fall-2018 and Spring-2019, there were 25 design based courses taken by the students. There were 23 "A or B' grades, 1 'C' grade, and 1 'F' grades.

Attached Files
There are no attachments.

2.2 Analyzing Progress (2018-2019):

For Thesis Option

- 80% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 50% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-3 was partially satisfied.

For Non-Thesis Option

- 92% of the students completed their design-based courses successfully in Fall-2017 and Spring-2018.
- LO-3 was satisfied.

Attached Files
There are no attachments.

2.3 *Criteria Met? (2018-2019)*:

SECTION 3:

3.1 Action plan(s):

ACTION PLAN - 1

Action: *COMP 5100 Software Engineering course should give multiple opportunities to the students to present.* The course should require at least one team presentation for the course project.

Proposal Date: Fall-2015

Target Date: Fall-2015

Actual Date: Fall-2015

Responsible Person: Dr. Ali Sekmen

Completed: Yes

Rationale: This action item was initiated by the course instructor for COMP 5100 Software Engineering. It was discussed with the graduate faculty in the Department.

Attached Files
There are no attachments.

3.2 Documentation:

Linked Documents
There are no attachments.

Attached Files
There are no attachments.

Related Items

Supports *(Connected Up):*

Scholarly Inquiry [Instruction]
000 Institution University Mission

Student Success and Customer Service
000 Institution TSU 2020 Strategic Plan

Supported By *(Connected Down):*

No supported by items currently associated

AY 2018 / ASSESSMENT & IMPROVEMENT PLAN

Leadership and Team Work

This view always presents the most current state of the plan item.
Plan Item was last modified on 7/31/19, 10:32 AM
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Template:

Student Learning Outcome (2015-2020)

Student Learning Outcome Name:

Leadership and Team Work

LO Number:

106-003.2-LO-04

Start:

7/1/2015

End:

6/30/2020

Progress:

Ongoing

Providing Department:

003 Computer Science (MS)

Responsible Roles:

Ali Sekmen (asekmen)

SECTION 1:

1. DEFINE LEARNING OUTCOME

1.1 Intended Outcome:

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

1.2 Criteria for Success:

For Thesis Option

(1) 75% of the students successfully defend their Thesis Proposal in first time taking COMP 5910.

(2) 75% of the students successfully defend their master Thesis in first or second time taking COMP 5920.

For Non-Thesis Option

(1) 75% of the students successfully complete their 6 credit hours of design based courses with a minimum of B grade.

Frequency/Cycle of Measurement:

Annually

1.3 Means of measurement/assessment:

The MS in Computer Science Program offers thesis and non-thesis options. The program requires completion of either a 6-credit hour thesis (Master Thesis-I and Master Thesis-II), for the thesis option, or 6 credit hours of design-based courses, for the non-thesis option, in addition to 27 credit hours of concentration-specific coursework.

For thesis option, a thesis manuscript and an oral presentation are required to document the student's research activity. A thesis committee supervises the student's thesis work. In Master Thesis-I, the student is required to provide an oral presentation (of Thesis Proposal) to the committee. In Master Thesis-II, the student is required to provide a Master Thesis Manuscript that includes

comprehensive analysis, development, and verification of a computing system, COMP 5920 Master Thesis II requires completion of Master Thesis and its successful oral defense. Therefore, Thesis Proposal Defense (with oral presentation), and Master Thesis Defense (with oral presentation) are used as means of measurement/assessment.

For non-thesis option, the student is required to take a minimum of 6 credit hours of design-based courses from a pool of courses determined by the Computer Science Graduate Faculty. Each design-based course requires a team-based class project with problem analysis, identification of solution, system design, and verification. Therefore, design-based coursework are used as means of measurement/assessment.

Attached Files
There are no attachments.

SECTION 2:

REPORT RESULTS

2.1 Reporting data (2015-2016):

For Thesis Option

	Spring-2015		Fall-2015		Spring-2016	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass	1st Attempt	Pass
	1	1	3	3	2	2
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass	1st Attempt	Pass
	-	-	1	0	3	1
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass	2nd Attempt	Pass
	-	-	1	1	1	1

For Non-Thesis Option

In Fall-2015 and Spring-2016, there were 17 students taking 3-credit design based courses. All of the students passed their courses with either B or A grades.

Attached Files
There are no attachments.

2.2 Analyzing progress (2015-2016):

For Thesis Option

- 100% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 100% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-4 was satisfied.

For Non-Thesis Option

- 100% of the students completed their design-based courses successfully in Fall-2015 and Spring-2016.
- LO-4 was satisfied.

2.3 *Criteria met? (2015-2016)*:

MET,

2.1 Reporting data (2016-2017):

For Non-Thesis Option

In Fall-2016 and Spring-2017, there were 13 students taking 3-credit design based courses. All of the students passed their courses with either B or A grades.

For Thesis Option

	Fall-2016		Spring-2017	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	1	1
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	1	1
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass
	2	1	2	1

Attached Files
There are no attachments.

2.2 Analyzing progress (2016-2017):

For Thesis Option

- 100% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 66.7% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-4 was partially satisfied.

For Non-Thesis Option

- 100% of the students completed their design-based courses successfully in Fall-2016 and Spring-2017.
- LO-4 was satisfied.

Attached Files
There are no attachments.

2.3 *Criteria met? (2016-2017)*:

MET,

2.1 Reporting Data (2017-2018):

For Non-Thesis Option

In Fall-2017 and Spring-2018, there were 20 students taking 3-credit design based courses. All of the students passed their courses with either B or A grades.

For Thesis Option

	Fall-2017		Spring-2018	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass
	3	3	4	4
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	3	-
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass
	-	-	-	-

Attached Files
There are no attachments.

2.2 Analyzing progress (2017-2018):

For Thesis Option

- 100% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 100% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-4 was satisfied.

For Non-Thesis Option

- 100% of the students completed their design-based courses successfully in Fall-2017 and Spring-2018.
- LO-4 was satisfied.

Attached Files
There are no attachments.

2.3 Criteria met? (2017-2018):

MET,

2.1 Reporting Data 2018-2019:

For Thesis Option

	Fall-2018		Spring-2019	
Thesis Proposal Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	4	3
Master Thesis Defense	1st Attempt	Pass	1st Attempt	Pass
	1	1	3	1
Master Thesis Defense	2nd Attempt	Pass	2nd Attempt	Pass
	3	2	1	0

For Non-Thesis Option

In Fall-2018 and Spring-2019, there were 25 design based courses taken by the students. There were 23 "A or B' grades, 1 'C' grade, and 1 'F' grades.

Attached Files
There are no attachments.

2.2 Analyzing Progress (2018-2019):

For Thesis Option

- 80% of the students successfully defended their Thesis Proposals in the first semester of taking COMP 5910 Master Thesis I course.
- 50% of the students successfully defended their Master Thesis in the first two semesters of taking COMP 5920 Master Thesis II course.
- LO-4 was partially satisfied.

For Non-Thesis Option

- 92% of the students completed their design-based courses successfully in Fall-2017 and Spring-2018.
- LO-4 was satisfied.

Attached Files
There are no attachments.

2.3 *Criteria Met? (2018-2019)*:

MET,

SECTION 3:

PLAN FOR IMPROVEMENT

3.1 Action plan(s):

ACTION PLAN - 1

Action: *COMP 5100 Software Engineering course should give multiple opportunities to the students to present.* The course should require at least one team presentation for the course project.

Proposal Date: Fall-2015

Target Date: Fall-2015

Actual Date: Fall-2015

Responsible Person: Dr. Ali Sekmen

Completed: Yes

Rationale: This action item was initiated by the course instructor for COMP 5100 Software Engineering. It was discussed with the graduate faculty in the Department.

ACTION PLAN - 2

Action: *Develop master thesis ideas with industry partners and advise students jointly with industry partners such as Bank of America.*

Proposal Date: Fall-2015

Target Date: Fall-2017

Actual Date: N/A

Responsible Person: Dr. Ali Sekmen and Dr. Tamara Rogers

Completed: No (This action was completed for the BS in CS Program, but it is still in progress for the MS in CS Program).

Rationale: Many faculty members expressed that our students should have state-of-the-art computer programming approach that may have direct real-life industry association. The entire faculty in the Department had extensive discussion of the Bank of America partnership to develop real-life master theses in partnership with the Bank.

Attached Files
There are no attachments.

3.2 Documentation:

Linked Documents
There are no attachments.

Attached Files
There are no attachments.

Related Items

Supports *(Connected Up):*

Scholarly Inquiry [Instruction]
000 Institution University Mission

Student Success and Customer Service
000 Institution TSU 2020 Strategic Plan

Supported By *(Connected Down):*

No supported by items currently associated

Documentation of Changes Made Seeking Improvement

TENNESSEE STATE UNIVERSITY

College of Engineering

Department of Computer Science

October 09, 2017

Graduate Faculty Meeting Minutes

Present: Doctors; Sekmen, Al Nasr, Chen, Erdemir, Rogers, Yao,

Next meeting: TBA

Meeting Agenda

The meeting was called to order at 3:10pm.

1. All faculties agreed to remove the COMP 4100 (OS) and COMP 3310 (Data Communication) from the requirements of admission for our graduate program.

2. Dr. Sekmen asked the faculty to send him the topics to be covered in the new class ENCS 6010 (Adv. Applied Math.) by Wednesday 10/11/2017.

3. Dr. Al Nasr will follow up with the student about taking an elective from courses outside the program of study without approval. A meeting with the new and current students was suggested.

4. Faculty members have agreed on the accelerated B.Sc.-M.Sc. program. Dr. Al Nasr will prepare the proposal of the tentative program. A separate meeting will be used to discuss the proposal. Tentatively, the students will be asked to take 3 classes (double-counting) toward their M.Sc. degree. Faculty suggested that the students should be free to choose from the graduate classes with no prerequisites.

TENNESSEE STATE UNIVERSITY

COLLEGE OF ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE

COMP 6400
AUTOMATA AND FORMAL LANGUAGES

INSTRUCTOR'S COURSE OUTCOMES ASSESSMENT REPORT

"CLOSING THE LOOP"

INSTRUCTOR: WEI CHEN
YEAR/SEMESTER: Fall 2019
IMPLEMENTATION DATE: December 6, 2019

CONTENTS

I. COURSE ASSESSMENT DATA

Summary of the Course Grades

	A	B	C	D	E	F	W	I	Total
Section 01	3	3							6

Summary of the Grade Evaluation Components

	Homework	Midterm Exam	Final Exam	Projects	Overall
Section 01	30%	25%	25%	20%	100%

Summary of Module Evaluation

Metric	*Student Outcomes*			
	1	2	3	4
Homework	3.50	3.50		
Project	3.60	3.60		
Midterm Exam	3.20	3.20		
Final Exam	3.10	3.10		
AVERAGE of Overall	3.35	3.35		
Course Outcome Assessment Survey	3.99	3.99		

II. RECOMMENDATIONS FROM STUDENT COURSE ASSESSMENT SURVEY

1. Good class
2. Everything in this course was fine

III. INSTRUCTOR'S RECOMMENDATIONS FOR CONTINUOUS IMPROVEMENT

The class was fine and doesn't need to change much in the next year. If the time is allowed, some new computation paradigms and applications such as quantum computing, block chain should be introduced.

APPENDIX-A

DETAILED ASSESSMENT AND EVALUATION

CRITERIA

The assessment is carried out by evaluating the students' performance on (1) Homework, (2) Course project & Midterm, (3) Final Exam, and (4) Student Course Outcome Assessment Survey. The criteria used to determine acceptable performance is that 80% students score 80% (B) or higher in homework, tests, final exam in each of two learning outcomes 1 & 2, and an average score of 3.0 or higher on a 4.0 scale in the student course outcome assessment survey.

1. **Assessment and evaluation of learning outcome 1:** "Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions."

   1.1. Evaluation
   This outcome is assessed with (1) homework 1-6, (2) midterm exam (course project), (3) final exam, and (4) student course outcome assessment survey. (1) On the average 83% of the students scored 80% or more in homework. It achieves the established criteria. (2) On the average 100% of the students scored 80% or more in the midterm exam (course project). It achieves the established criteria. (3) On the average 83% of the students scored 80% or more in final exam. It achieves the established criteria. The overall result of outcome from (1) – (3) is 3.35 and achieves the established criteria.
   (4) The result of the student course outcome assessment survey is 3.99 out of 4.00. It achieves the established criteria

   1.2. Recommendation for improvement:
   The class was fine and doesn't need to change much in the next year. If the time allowed, some new computation paradigm and applications such as quantum computing, block chain should be introduced.

2. **Assessment and evaluation of learning outcome 2:** "Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements with the focus of their concentrations."

   2.1. Evaluation
   This outcome is assessed with (1) homework 1-6, (2) midterm exam (course project), (3) final exam, and (4) student course outcome assessment survey. (1) On the average 83% of the students scored 80% or more in homework. It achieves the established criteria. (2) On the average 100% of the students scored 80% or more in the midterm exam (course project). It achieves the established criteria. (3) On the average 83% of the students scored 80% or more in final exam. It achieves the established criteria. The overall result of outcome from (1) – (3) is 3.35 and achieves the established criteria.
   (4) The result of the student course outcome assessment survey is 3.99 out of 4.00. It achieves the established criteria.

   2.2. Recommendation for Improvement
   Same as Section 1.2

METRICS TO ASSESS COURSE OUTCOMES

Describe categories of tools that were used to measure success in each learning outcome.

Homework, lab work, midterm test, final exam and student course outcome assessment survey were used to cover all the topics in the lectures and determine competencies in outcomes a, b, j.

Metric	ABET Outcomes			
	1	2	5	6
Homework Module 2	x	x		
Homework Module 2	x	x		
Homework Module 3	x	x		
Homework Module 4	x	x		
Homework Module 5	x	x		
Homework Module 6	x	x		
Course Project	x	x		
Midterm exam	x	x		
Final Exam	x	x		
Student Course Outcome Assessment Survey	x	x		

MODULES FOR ASSESSMENT OF PROGRAM OUTPUT

OUTCOME#	OUTCOMES	EVALUATION TOOLS
1	Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.	Homework 1-6, project, midterm test, final exam, and student course outcome assessment survey
2	Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements with the focus of their concentrations.	Homework 1-6, project, midterm test, final exam, and student course outcome assessment survey

APPENDIX-B

UPDATED COURSE OUTLINE
COLLEGE OF ENGINEERING, TECHNOLOGY, AND COMPUTER SCIENCE
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
TENNESSEE STATE UNIVERSITY

COURSE DESCRIPTION FOR COMP 6400
DISTRIBUTED ALGORITHM DESIGN AND DATA ANALYSIS

SEMESTER: Fall -2020 **PROFESSOR: Dr. Wei Chen**

CATALOG COURSE DESCRIPTION

COMP 6400 Distributed Algorithm Design and Data Analysis (3): The course introduces the computing models and algorithms of distribution systems. The course also exposes students to an array of big data analysis theories, techniques and practices in different fields of study using distributed models. The topics include distributed computing models, massage-passing and shared memory systems, design and analysis of synchronous and asynchronous algorithms, fault tolerance, and data distribution, collection, processing and analysis in distributed systems. This is a project-based course that provides students with hands-on experience on distributed computing with different data types. Prerequisite: COMP 5200 or equivalent.

COURSE OBJECTIVES

(1) Introduce the concepts, models and theory of distributed computing systems (PO 1 & PO 2).
(2) Design and analyze the algorithms for the fundamental problems in synchronous and asynchronous distributed computer networks (PO 1 & PO 2).
(3) Expose the important issues in the design and analysis such as resource allocation, synchronization, global/local clock, dead lock, fault tolerance, security, and etc in HPC, networked computers, wireless/sensor networks, IoTs, etc (PO 1 & PO 2).
(4) Project-based study centered on hands-on experiences with methods on different types of data and frameworks (PO 1 & PO 2).

PREREQUISITES

COMP 5200 Advanced Algorithms Design and Analysis and equivalent.

LEARNIN OUTCOMES

1. Understand the different types of distributed systems architectures (LO 1 & 2)
2. Understand the important issues such as synchronization, resource allocation and ect. in distributed systems (LO 1 & 2)
3. Ability to design algorithms for fundamental problems in synchronous/asynchronous networks (LO 1 & 2)
4. Ability to deal with the fault tolerance and security in distributed systems (LO 1 & 2)
5. Ability to use different available frameworks to do the computation and analyze data (LO 1 & 2)
6. Ability to solve real world problems based on above 1 – 5 (LO 1 & 2).

GENERAL INFORMATION

1. Number of Credit Hours: 3
2. Text Books & References
   (i) Title: Distributed Algorithms
   Author: Nancy A. Lynch
   Publisher: Morgan Kaufmann
   ISBN: 9781558603486
   (ii) Title: Distributed Algorithms: An Intuitive Approach.
   Authors: Wan Fokkink
   Publisher: The MIT Press (2013)
   Adoption: Required
   ISBN: 9780262026772
   (iii) Title: An Introduction to Parallel Programming
   Author: Peter S. Pacheco
   Publisher: MK
   ISBN: 978012374260-5
   (iv) Lecture notes

3. **Class Meetings:**
   Office Hours:
4. **Instructor:**

Name:	Dr. Wei Chen
Office Location:	05P
Telephone:	615-963-5878
Email:	
Tutoring Hours	
Office Hours:	
URL:	wchen@tnstate.edu/faculty/wchen

EVALUATION AND GRADING

Grade will be based on assignments, one in-class mid-term exam, one in-class final exam, one project and its associated report. The assignments, exams, project are not optional. Failure to attend or turn in without discussion with the instructor beforehand will result in an *F* in the class.

Grading	Score Range	Significance
A	90-100%	Outstanding Performance
B	80-89%	Above Average Performance
C	70-79%	Average Performance
D	60-69%	Passing, Below Average Performance
F	0-59%	Unsatisfactory Performance

Assignments	30%
Project	30%
Mid-term	20%
Final	20%

ASSIGNMENTS

1. Homework assignments are a means of practicing to learn the course topics. Submitting homework assignments is not the sufficient condition for passing the course. All homework assignments must be submitted by the due date/time.
2. Homework assignments can be worked out individually or collectively in small groups. However, copying other students' work is absolutely prohibited.
3. Written assignments must be submitted in readable and clean forms. NO CREDIT will be given for a non-readable work.
4. Programming assignments must be completely implemented and executable. Any program with syntax error(s) will be given a score of 0(zero). All pages of work, if any, and USB flash drives must be labeled properly. Student name, assignment number, course number and class section must be clearly indicated. A hard copy of each program must be submitted along with a USB flash drive.
5. No test will be repeated for students who miss tests, no matter what is the reason. However, if a student misses a test for a reason accepted and certified by Students Affair Office, then score of the following test will be recorded for the score of the missing test
6. Instructor reserves the right to modify the score weights.

E. DETAILED COURSE OUTLINE

Lectures	Date	Topics	Assignment /Project
1		Review of data structures, algorithms design and analysis	
2		**Introduction to distributed/parallel computing systems:** architectures, shared & distributed memory, computation & communication models, control/data/processes	Assignment 1
3		**Computing on shared memory in fixed-connection networks I:** PRAM computational models and algorithm design	Assignment 2
4		**Computing on shared memory in fixed-connection networks II:** OpenMP and GPU computing platforms	Project 1
5		**Computing on distributed memory in networks of computers/ wireless devices**: MPI/PVM computing platforms. Autonomy, synchronization, resource allocation, workload balance, robustness, and security.	Assignment 3
6		**Computing on synchronous computer networks I:** Synchronous network model; Algorithms of synchronized networks: Leader election in a synchronous ring and in general synchronous networks, Breadth-First search	
7		**Midterm Exam**	
8		**Computing on synchronous networks II:** Shortest path, Minimum spanning tree, Distributed consensus with link/process failures	Assignment 4
9		**Computing on asynchronous networks I:** Asynchronous network model: Send/Receive systems, Broadcast systems, Multicast system; Algorithms of synchronized networks: Leader election	
10		**Computing on asynchronous networks II:** Spanning tree, Breadth-First search; Synchronizers; Local time and global snapshots, Resource allocation, Deadlock and Dinner of philosophers problem	Assignment 5
11		**Security issues in distributed systems I**	

12		**Security issues in distributed system II**	Project 2 Assignment 6
13		**Applications in Distributed systems I**	
14		**Applications in Distributed systems II**	Assignment 7
15		**Course review**	

APPENDIX-C

TENNESSEE STATE UNIVERITY
DEPARTMENT OF COMPUTER SCIENCE
COMP 6400 – DISTRIBUTED ALGORITHM DESIGN AND DATA ANALYSIS
Fall 2019 – Dr. Wei Chen
STUDENT COURSE ASSESSMENT SURVEY

As a computer science graduate student in this class, we are requesting your evaluation of how this course has helped to prepare you to meet course educational objectives. The data is needed as part of our plan to continuously improve the quality of computer science education at Tennessee State University. Please rate how this course has contributed to preparing you with each of the outcomes using the following scale:

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly Agree

Part A. Questions regarding your preparation		**Rating**				**Student Outcomes**	**Program outcomes**
		1	**2**	**3**	**4**		
1	I feel I had sufficient knowledge in prerequisites to be successful in the course. Ave: 3.83			1	5		
2	List any deficiencies you wish you did not have:						
Part B. Having taken this course, I can demonstrate the following:		**1**	**2**	**3**	**4**		
1	Classification of parallel and distributed systems. Ave: 4.0				6	**1, 2**	**1, 2**
2	Computation/communication models and time/communication complexity for distributed systems. Ave: 4.0				6	**1, 2**	**1, 2**
3	High performance computing using shared memory for multicore computer systems. Ave: 4.0				6	**1, 2**	**1, 2**
4	High performance computing using message passing for networked computers. Ave: 4.0				6	**1, 2**	**1, 2**
5	Fundamental algorithms for synchronous networks. Ave: 4.0				6	**1, 2**	**1, 2**
6	Fundamental algorithms for asynchronous networks. Ave: 3.83			1	5	**1, 2**	**1, 2**
7	Important issues such as logical clock, deadlock, snapshot in distributed systems. Ave: 4.0				6	**1, 2**	**1, 2**
8	Real world applications such as sensor/ad hoc/mobile networks, IoT, and etc. Ave: 4.0				6	**1, 2**	**1, 2**
8	Please provide recommendations for improving this course. • Good class • Everything in this course was fine						

FORM - COVER (Required for All Proposals)

Sponsoring Institution(s): **Tennessee State University**

Proposal: **Establish new concentration- *Data Science* Concentration in M.S. in Computer Science**

Degree Designation [or] Type of Certificate: **Master of Science**

M.S.	**Computer Science**
Formal Degree Abbreviation	Title of Proposed Program to be established or impacted

Concentrations: **Data Science**

Delivery Site(s): **Tennessee State University**

Proposed CIP Code: **No Change**

Proposed Implementation Date: **Fall-2020**

Cooperative Partners:

For more information contact: **Dr. Ali Sekmen** (Name) **615 963 5712** (Telephone)

Institutional Approval: _____/_____

Signature of President ***Date***

FORM - SUM (Summary) (No more than 2 pages + attachments)

INSTITUTION: Tennessee State University

PROPOSAL: Establishment of *Data Science* Concentration

EFFECTIVE DATE: Fall-2020

PURPOSE (Goals and Objectives):

Goal: Data science is the analysis of large data sets in order to draw insights and to extract information. The growing data deluge from multiple sources require skilled data scientists to extract meaning and actionable intelligence from these data sets. Data science applications are everywhere, seen in machine learning, and creating visualizations of high dimensional data. The data science concentration at TSU gives students a thorough grounding in computer science, mathematics and statistics in order for students to successfully navigate the world of big data.

Objectives:

1. *Prepare a globally competitive workforce in data science.*
   The Department of Computer Science and the College of Engineering will help TSU become a leading institution in development of a globally competitive workforce in data science with solid foundation in core areas of data science with an opportunity to specialize in various subareas.

2. *Enhance the interest and student enrolment in Computer Science and College of Engineering*
   It is expected that the proposed concentration will attract interest from (1) our current undergraduate programs in computer science, engineering, mathematical sciences, agricultural sciences, and business, (2) IT professionals from Middle Tennessee, (3) undergraduate students from peer institutions, and (4) international students.

CURRICULUM: The proposed program requires completion of 33 semester credit hours shown as in Table 1. Please see Table 2 for the core courses in concentration.

Table 1
Courses in the Data Science Concentration

Curriculum Component	Hours Required
Major Field Core	9
Concentration Core	12
Electives	6
Design Project Course **OR** Thesis	6
TOTAL:	**33**

Number of new courses: 2 new courses: (1) COMP 5500 Introduction to Data Science and (2) COMP 5850 Data Visualization.

Table 2
Concentration Core Courses

Course Number	Course Title	Credit Hours
COMP 5400	Hybrid and Relational Databases	3
COMP 5500	Introduction to Data Science	3
COMP 6200	Machine Learning	3
COMP 5850	Data Visualization	3

NEED:

Educational Need

Data Science applies statistical and computational techniques, algorithms, and theories of computer science to solve problems arising from the analysis of big data. It usually focuses on development of computationally intensive data mining, pattern recognition, machine learning, and visualization techniques to increase understanding of large data.

Student Interest/Demand

The students in Departments of Computer Science and College of Engineering have shown their interest in Data Science. Based on their demands, the Computer Science departments has provided a number of courses in various areas of data sciences such as Machine Learning, Deep Learning, Hybrid and Relational Databases, Computer Vision, Distributed Algorithms, and Bioinformatics. It comes the time to establishing a new concentration so that the students can receive complete, consistent and well-structured knowledge in Data Science.

Labor Market Evidence

The workforce of highly competitive students in various areas of data science is demanded locally and globally. For example, there over 400 healthcare companies and support firms in Nashville area and they need qualified persons in analysis of big data. This concentration will boost the interest in this area by supporting undergraduate education and research.

Societal Need Evidence

Knowledge of modeling, analysis, interpretation, and explaining data has become the basic requirement for wide areas of science, engineering, medicine, agriculture, and related areas.

IMPACT: The proposed concentration will improve the retention on science and engineering at TSU. The proposed concentration is expected to boost interest in the fields of science, mathematics, and engineering at TSU. This concentration will also enable students from Computer Science and Engineering to be involved in interdisciplinary data sciences research and education experiences.

PLANS FOR ACCREDITATION: There is no accreditation agency for graduate programs in computer science. However, the MS in CS Program goes through TBR Academic Audit.

ATTACHMENT: COURSE DESCRIPTIONS FOR THE CONCENTRATION IN DATA SCIENCE

Required Concentration Core Courses

Existing Courses in MS in CS Curriculum

COMP 5400 Hybrid and Relational Databases. (3) This course presents relational, object-oriented, and hybrid database concepts. Topics include: definitions of objects and attributes, methods and messages, classes, object-oriented data models, architectural issues, the object-oriented database system manifesto, object-oriented database design, object-oriented database management systems, and object/relational database management systems. Prerequisite: None.

COMP 6200 Machine Learning. (3) This course provides a broad introduction to machine learning, data-mining, and statistical pattern recognition. Topics include: (i) Supervised learning (parametric/non-parametric algorithms, support vector machines, kernels, neural networks). (ii) Unsupervised learning (clustering, dimensionality reduction, recommender systems, deep learning). (iii) Best practices in machine learning (bias/variance theory; innovation process in machine learning and AI). The course will also draw from numerous case studies and applications, so that you'll also learn how to apply learning algorithms to building smart robots (perception, control), text understanding (web search, anti-spam), computer vision, medical informatics, audio, database mining, and other areas. Prerequisite: ENGR 5100 or Equivalent.

New Courses to be Developed

COMP 5500 Introduction to Data Science. (3) This course is an introduction to data science and the analysis of large data sets in order to draw insights and to extract information. The course covers using Python libraries for reading large data sets including Numpy and Pandas, reading input from standardized formats, calculating statistical measures from large data sets, linear regression, and evaluating model accuracy, precision and sensitivity. The course also covers logistic regression, unsupervised learning including k-means and hierarchical clustering, and time-series analysis with relational and non-relationship databases. It also covers sentiment analysis and recommendation systems. Prerequisite: None.

COMP 5850 Data Visualization. (3) This course is an introduction to data visualization and the graphical representation of data. The growing data deluge from multiple sources require skills in representing data, in order to extract meaning and actionable intelligence from these data sets. Students learn how to communicate the relationship between data through systematic mapping between graphical representations and the underlying data values. The class teaches how representations of data can give insight and make data analysis easier. Prerequisite: None.

FORM - PS (Program Structure)

A. Total credits required for graduation: 33

B. Residency requirements (if any): Per University Catalog

C. General Education: None

D. Major Field Core: Total credits: 9 hours - (Table 3)

Table 3
Major Field Core Courses

Course Number	Course Title	Credit Hours
COMP 5100	Software Engineering	3
COMP 5200	Advanced Algorithms Design and Analysis	3
COMP 5300	Advanced Computer Architectures	3

E. Concentrations(s): Total credits: 12 hours - (Table 4)

Table 4
Major Field Core Courses

Course Number	Course Title	Credit Hours
COMP 5400	Hybrid and Relational Databases	3
COMP 5500	Introduction to Data Science	3
COMP 6200	Machine Learning	3
COMP 5850	Data Visualization	3

F. Electives: Total credits: 6 hours

Two elective courses with the consent of advisor from the MS in CS curriculum with possibility of taking courses from PhD in CISE Program at TSU. The following two courses are highly encouraged to take.

- COMP 6400 Distributed Algorithms Design and Data Analysis
- COMP 5900 Special Topics: Deep Learning

G. Other credits: 6 hours

Non-Thesis Option: Two design-based courses with the consent of advisor from the MS in CS curriculum with possibility of taking courses from PhD in CISE Program at TSU.

Thesis Option: COMP 5910 Master Thesis I and COMP 5920 Master Thesis II. The students are required to complete a two-semester master thesis whose research topic is required to be in data science.

H. Admission, Retention, and Graduation Requirements (Provide complete statement only if requirements are different from standard institutional requirements as stated in the *Catalog*.)

Standard institutional requirements as stated in the Graduate Catalog.

I. Describe any unique features such as interdepartmental cooperation, collaboration with other institutions, articulation, industry partnerships, etc.

The Department of Computer Science has a partnership with Google. As part of our partnership, Google provides a full-time instructor every fall semester with all expenses paid by Google. The proposed concentration was developed jointly with Dr. See-Mong Tan from Google. He is a visiting professor from Google in Fall-2019 (our 4th Google instructor). Dr. Tan received his bachelors from the University of California at Berkeley in electrical engineering and computer science, and then received his Masters and PhD from the University of Illinois at Urbana-Champaign. He founded two early Internet video streaming startups, one of which was acquired successfully. He has held senior management positions at Apple, Microsoft, Amazon and is currently managing different technical programs for Google Maps.

Since its establishment in Fall-2014, the MS in CS Program has become a signature program in the College of Engineering at TSU. The program has achieved its enrollment and graduation projections in the last five years. The Since 2013, the Department hired four tenure-track assistant professors in high-demand areas of computer science. Our graduate faculty are highly active in attracting research funding of **$4,342,739** research grants as principal investigators in 2013-2019. All faculty members involved with the MS in CS Program are professionally active in developing their expertise spanning in data sciences, cybersecurity, computer networks, artificial intelligence, and bioinformatics. They have been involved with conducting research, developing proposals for research and projects, cooperating with other faculty from outside of the College and University, organizing international/national conferences and symposia, disseminating results of their research in journal and conference proceedings. They are participating and serving in activities of a number of journals, and local and national professional societies. Some faculty members have been involved in proposal reviewing for government funding agencies such as NSF or U.S. Army.

The Department has strong established relationships with some major IT companies (e.g. Google and Bank of America) and we provide many opportunities for our students to have internship positions in industry. Many students participate multiple hackathons organized by partner companies. For example, Microsoft and Google organized such hackathons at TSU in 2017 and 2018.

J. Description of New Courses: Provide rubric, number, title, credit hours and catalog description of each new course needed for full implementation of the proposed program.

COMP 5500 Introduction to Data Science. (3) This course is an introduction to data science and the analysis of large data sets in order to draw insights and to extract information. The course covers using Python libraries for reading large data sets including Numpy and Pandas, reading input from standardized formats, calculating statistical measures from large data sets, linear regression, and evaluating model accuracy, precision and sensitivity. The course also covers logistic regression, unsupervised learning including k-means and hierarchical clustering, and time-series analysis with relational and non-relationship databases. It also covers sentiment analysis and recommendation systems. Prerequisite: None.

COMP 5850 Data Visualization. (3) This course is an introduction to data visualization and the graphical representation of data. The growing data deluge from multiple sources require skills in representing data, in order to extract meaning and actionable intelligence from these data sets. Students learn how to communicate the relationship between data through systematic mapping between graphical representations and the underlying data values. The class teaches how representations of data can give insight and make data analysis easier. Prerequisite: None.

FORM – PJ (Program Performance and Justification)

Institution: Tennessee State University

Program Name: Data Science Concentration in M.S. in Computer Science

Date: Fall-2020

Accreditation

- Institutional plans for program accreditation, if applicable, including accrediting agency and timeline. If there are no plans to seek specialized accreditation, please provide reasons.

  The undergraduate program in Computer Science has been accredited by ABET/CAC since 2010 and it is fully accredited until 2022. ABET/CAC does not accredit graduate programs. However, the MS in CS Program goes through TBR Academic Audit.

- State whether this proposal has implications for SACS. If so, explain what actions will be taken.

  None.

Evaluation Plans

- List the assessment standards that are most appropriate for measuring the effectiveness and success of the proposed program as related to the stated goals and objectives.

  - ✓ The number of the students enrolled in the new concentration,
  - ✓ The employment rate of the graduates in the areas related to data science,
  - ✓ The percentage of the graduates who pursue PhD in data science.
  - ✓ Satisfaction of employers from the graduates of the Data Science Concentration.
  - ✓ Increase in the research activities in data science such as number of student presentations and publications.

- Identify the institutional office responsible for conducting the evaluation and explain how evaluations will be conducted, i.e., alumni surveys, employer surveys, external review, pass rates on certification/licensure exams, etc.

  The Department of Computer Science in the College of Engineering at Tennessee State University will be responsible. Various tools including graduating senior survey, alumni survey, and employer survey will be used to evaluate the assessment standards.

Evidence of Demand and Need

- *Educational Need*

  Data Science applies statistical and computational techniques, algorithms, and theories of computer science to solve problems arising from the analysis of big data. It usually focuses on development of computationally intensive data mining, pattern recognition, machine learning, and visualization techniques to increase understanding of large data.

- *Student Interest/Demand*

  The students in Departments of Computer Science and College of Engineering have shown their interest in Data Science. Based on their demands, the Computer Science departments has provided a number of courses in various areas of data sciences such as Machine Learning, Deep Learning, Hybrid and Relational Databases, Computer Vision, Distributed Algorithms, and Bioinformatics. It comes the time to establishing a new concentration so that the students can receive complete, consistent and well-structured knowledge in Data Science.

- *Labor Market Evidence*

  The workforce of highly competitive students in various areas of data science is demanded locally and globally. For example, there over 400 healthcare companies and support firms in Nashville area and they need qualified persons in analysis of big data. This concentration will boost the interest in this area by supporting undergraduate education and research.

- *Societal Need Evidence*

  Knowledge of modeling, analysis, interpretation, and explaining data has become the basic requirement for wide areas of science, engineering, medicine, agriculture, and related areas.

- Program Duplication: Identify similar programs offered by other public or private institutions in the state. Explain why the primary objective cannot be met by existing programs.

  The MS in CS Program at Tennessee State University does not offer a general computer science MS in CS Program. The students are required to choose one of the existing concentrations. None of the peer former-TBR Universities in Middle Tennessee offers a Data Science Concentration in MS in CS Programs.

Human Resource Needs

- Faculty
- Administrative
- Clerical and Support Personnel

  All courses (but two) required for the concentration either already exist. No extra human resources are requested.

Other Needs for Support

- Library

- Instructional Facilities
- Instructional Equipment
- Other Needs

No facilities, equipment, library, and other support are requested as the existing computing resources are currently sufficient for the proposed concentration.

FORM SE Student Enrollment Projections

Estimate the unduplicated headcount and full-time equated enrollment and the number of graduates for a complete program cycle.

Year	Full-Time Headcount	Part-time Headcount	Total Year Headcount	FTE	Graduates
1	10	5	15	10.94	0
2	15	5	20	15.31	10
3	15	5	20	15.31	20
4	15	5	20	15.31	20
5	15	5	20	15.31	20

Explain the basic assumptions used in estimating the size of the proposed program. Assumptions should be related to the evidence of need and to other supportive data.

- ✓ The complete concentration cycle for full-time students is 4 semesters. The complete program cycle for part-time students is assumed to be 6-8 semesters.

- ✓ The number of the students is estimated based on the current student numbers in the Departments of Computer Science. We currently have over 35 students in the MS in CS Program and some of those students expressed that the current two concentrations do not meet their needs and they are interested in the proposed Data Science concentration.

Meeting minutes 11/13/19

Topic: Assessment and improvement of Thesis I and Thesis II

Attenders: Drs. Wei Chen, Erdem Erdemir, Tamara Rogers

Discussion and recommendation:

Identified problems:

1. The students make the decision for the thesis option too late. Otherwise, they can be involved in the related study/research earlier than Thesis I and get prepared.
2. The thesis topics are too challenge sometimes. The weights of non-thesis option and thesis option are not balanced, which discourage students to take the thesis option.
3. Common skills for thesis may not be provided sufficiently in Thesis I and Thesis II classes, and may not be synchronous with the thesis process.
4. Thesis defense haven't been evaluated formally.

Recommendations for improvement

1. **Preparation:** The new admitted students should receive enough information to make the decision for the thesis potion. As long as a student made the decision, the student should be helped by the graduate coordinator to identify the proper thesis advisor and to join the corresponding research project immediately.
2. **Thesis I:** Literature survey should be complete by the midterm exam week. Align with this timeline, the students should learn how to read papers in Thesis I class. Thesis proposal should be complete by the end of the semester. Align with this timeline, students should learn the corresponding skills in class such as problem identification, modeling, complexity analysis, etc.
3. **Thesis II:** Student should learn the skills of technical writing and presentation in Thesis II class when they prepare the thesis and defense. Thesis defense should be formally evaluated by the thesis committee and attenders.
4. **Advisor:** students should be advised ASAP even before they take Thesis I class. Thesis topic should be decided no later than the second week of Thesis I. Advisor should provide stepwise milestones with timelines for checking the progress.
5. **Graduate faculty:** graduate faculty are the rich resources. They should be invited to co-teach the common skills for thesis in Thesis I and Thesis II classes.
6. **Design based courses:** Every design based course should have a semester long project. The weight of two design based courses should be the same as Thesis I and II. In other words, students should learn equivalent knowledge and skills for thesis option and non-thesis option.
7. **Resources for how to write thesis and how to do defense:** The Thesis I and Thesis II course instructor should ask all students to provide concise reviews of at least 10 articles related to the student's area of research. The instructor should provide feedback and work with the students on improving reviews.

Form A1:5D

THEC

Policy A1.5 Academic Actions Notification

Form A1:5D: Establish a New Concentration within an Existing Academic Program

Reporting Schedule Notification Dates:

_____ May 15 for all actions approved between Jan 1 and April 30
_____ Aug 15 for all actions approved between May 1 and July 31
_____ Jan 15 for all actions approved between Aug 1 and Dec 31

Institution: Tennessee State University

10 Digit Program CIP Code *(XX.XX.XXXX.XX)*: 06.11.0701.00

Academic Program Title: Computer Science **Degree Designation:** M.S.

New Concentration Title: Data Science

Institutional or Governing Board Approval Date *(month/year)*: _____

Implementation Date *(month/year)*: August 2020

Provide a brief rationale for the new concentration and how it will contribute to the overall academic program.

Data science is the analysis of large data sets in order to draw insights and to extract information. The growing data deluge from multiple sources require skilled data scientists to extract meaning and actionable intelligence from these data sets. Data science applications are everywhere, seen in machine learning, and creating visualizations of high dimensional data. The data science concentration at TSU gives students a thorough grounding in computer science, mathematics and statistics in order for students to successfully navigate the world of big data.

The Department of Computer Science and the College of Engineering will help TSU become a leading institution in development of globally competitive workforce in data sciences with solid foundation in core areas of data sciences with an opportunity to specialize in various subareas. It is expected that the proposed concentration will attract students from (1) our current undergraduate programs in computer science, engineering, mathematical sciences, agricultural sciences, and business, and (2) IT professionals from Middle Tennessee.

_____ _____

Chief Academic Officer Signature *(electronic signature acceptable)* **Date**