



Final Annual Report

Tennessee Tech University

President

Provost

College of Engineering

Electrical and Computer Engineering

Electrical Engineering MS



Electrical and Computer Engineering MS

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Mission/Vision/Goal Statement

Provide quality undergraduate and graduate education and perform research in the areas of electrical and computer engineering to enhance the competitiveness of our graduates and contribute to economic, scientific, and social development.

The Program Goals of TTU MSECE programs are:

1. Graduates of the M.S. program will have the technical competence to be successful in the chosen area of study in electrical and computer engineering professional practice or research.
2. Graduates of the M.S. program will have the skills to undertake technically sound analysis independently and present their work at professional meetings or publish their work in scholarly journals.
3. Graduates of the M.S. program will have the technical competence to successfully undertake further advanced study at the doctoral level in electrical and computer engineering or a related area, and pursue lifelong learning through professional education.



Outcome 1

Define Goal

**Intended Outcomes / Objectives****The Student Learning Outcomes of the MSECE program are:**

Students of the MS program in Electrical and Computer Engineering will be able to:

1. Demonstrate clear understanding of the chosen area of emphasis in electrical and computer engineering covered in course material in the graduate program.

**Outcome 2****Define Goal****Intended Outcomes / Objectives****The Student Learning Outcomes of the MSECE program are:**

Students of the MS program in Electrical and Computer Engineering will be able to:

2. Apply advanced methods in the development of solutions in the chosen area of emphasis in electrical and computer engineering.

**Outcome 3****Define Goal****Intended Outcomes / Objectives****The Student Learning Outcomes of the MSECE program are:**

Students of the MS program in Electrical and Computer Engineering will be able to:



3. Give professional presentations or write scholarly manuscripts worthy of publication in peer reviewed journals.



Assessment: Completion of Core Course and other Graduate Level Course Requirements

Goal/ Outcome/ Objective: Outcomes: 1, 2.

Type of Tool: Other

Rationale

Course work required for MSECE is as follows:

Thesis Track MS Program of Study

ECE 6910 Intro to Graduate Research -1 credit

Two ECE graduate breadth courses - 6 credits

Elective courses (some may be outside ECE) - 9 credits

Two ECE 6990 Research & Thesis courses - 6 credits

Total: 31 credits

Non-Thesis Track MS Program of Study

ECE 6910 Intro to Graduate Research - 1 credit

Three ECE graduate breadth courses - 9 credits

Four ECE Elective courses (some may be outside ECE) - 12 credits

Elective courses (some may be outside ECE) - 9 credits

ECE 6970 - Non-Thesis Design Project – 3 credits

Total: 34 credits

Each MS student must three ECE graduate breadth courses from a list maintained by the ECE Departemnt. No more than six credits (2 courses) of 5000-level courses may be used to satisfy the MS requirements. No more than six credits (2 courses) of directed study ECE 6980/7980 may be used to satisfy the MS requirements. A maximum of nine credits (3 courses) of approved graduate coursework may be transferred from another university to satisfy the MS requirements. Admission to Candidacy is achieved following the term in which a student completes 9 hours, usually at the beginning of the second semester, at the same time the Program of Study is submitted. The basic requirements for candidacy are full standing, completion of nine credit hours of graduate work, and a TTU GPA of at least 3.0.



Frequency of Assessment: Each semester

 **Assessment: Completion of Master's Thesis or Independent Project/Comprehensive Exam**

Goal/ Outcome/ Objective: Outcomes: 1, 2

Type of Tool: Other

Rationale

For the thesis option, this entails the requirement of writing a thesis, which must be successfully defended. The quality of the thesis is demonstrated by approval from the student's Advisory Committee. The Oral Defense of a thesis consists of an oral presentation by the student of her/his thesis research results, followed by questioning by colleagues and their committee. The overall intention is to test the breadth of knowledge in the discipline, depth in the specific area of research and ability to integrate concepts and techniques learned in the various courses. The defense begins with an open session in which the candidates make a presentation to their committee and other faculty and students. The audience then asks the candidate questions regarding their research work. Afterward, in a closed session, the committee examines the candidate on the details of their thesis, as well as any other relevant material. Then the candidate is asked to leave the room, and the committee discusses the candidate's performance and then votes to pass or fail the candidate. The student must pass this defense by three (3) positive votes or three-fourths of the committee members eligible to vote. A signature form is then forwarded to the Office of Graduate Studies with the results of the defense. If the candidate passes the defense, the committee instructs the candidate on any required changes needed to complete their work. If the candidate fails the defense, the committee informs the candidate in writing regarding the additional work that the candidate must undertake before defending a second time. The second attempt may be scheduled as soon as these deficiencies are rectified. However, failure on the second attempt results in dismissal from the graduate program.

For the non-thesis option, there is a 3 credit hour semester-long Non-Thesis Design Project course (ECE 6970) to address the University and program requirement that students be able to demonstrate the ability to engage in independent learning and discovery. In addition to the independent project, the MSECE non-thesis option requires a final Comprehensive Exam. The Comprehensive Examination is a four-hour written examination taken during the semester of graduation, consisting of two questions from each of three ECE graduate breadth courses chosen by the student. These questions are prepared and graded by the professor responsible for that core course. The Department Chair is responsible for assembling, proctoring, and compiling the overall score on the exam. An overall score of 70 percent is required to pass. A committee signature form is then forwarded to the office of Graduate Studies that shows the result of the examination. If the student fails this exam, he or she will be given a written list of specific deficiencies that must be addressed prior to a second



exam attempt. That second attempt may be scheduled as soon as the deficiencies are rectified. However, failure on the second attempt results in dismissal from the MS program.

Frequency of Assessment: As needed

Assessment: ECE Department Graduate Program Committee Feedback

Goal/ Outcome/ Objective: Outcomes: 1, 2, 3

Type of Tool: Other

Rationale

The department has a Graduate Program Committee that includes at least one faculty member from each area of research. This committee meets several times a semester to discuss the performance, quality, and possible improvements applicable to the MSECE Program. It also receives input from faculty and students proposing changes to the curriculum or other aspects of the graduate program and monitors the impact of changes once implemented.

Frequency of Assessment: Several times per semester

Assessment: Evaluation of Thesis and Defense

Goal/ Outcome/ Objective: Outcomes: 1, 2, 3

Type of Tool:

Rationale

For the thesis option, a survey form is used to evaluate the presentation. The survey is completed by the student's committee members as well as all others in attendance. The form is attached.

 MS Thesis and Defense Assessment

Frequency of Assessment: As needed

Assessment: Record of Presentations and Publications

Goal/ Outcome/ Objective: Outcome: 3

Type of Tool: Other

Rationale

The Annual Student Research Day is an opportunity for graduate students to make presentations of their research. In addition, students are encouraged to submit publications to conferences and journals stemming from graduate course work and



their thesis research.

Frequency of Assessment: Annually



Results: Completion of Breadth Course and other Graduate Level Course Requirements

Goal/Objective/Outcome Number:

Results

Assessments of student learning are carried out by examining homework, class projects and exams for each ECE graduate course. Achievement of student learning outcomes have been satisfactory because of the many student-authored class project reports, assignments, journal publications, presentations, theses produced.

Attachments

No items to display.



Results: Completion of Master's Thesis or Independent Project/Comprehensive Exam

Goal/Objective/Outcome Number:

Results

The following table shows the number of MS students who successfully completed the requirements for Thesis/Project/Exam over the past 6 academic years. As pointed out earlier, several individuals must approve the completion of these milestones.

Academic Year	Number of Completed Thesis/Projects/Exams
2016-2017	9
2015-2016	7
2014-2015	3
2013-2014	11
2012-2013	8
2011-2012	6

**Attachments**

No items to display.

**Results: ECE Department Graduate Program Committee Feedback**

Goal/Objective/Outcome Number:

Results

New Graduate courses are typically taught for the first time as ECE 6900 Special Problems in EE and then a new course is proposed to the Graduate Committee for Approval. University approval is required for new course additions. New offerings are continually being taught.

In Fall 2016 Sp ECE 6980 Prob in EE: Security/Privacy for Wireless Networks was taught.

A requirement that all MS students either present a paper at a conference or participate in TTU Research Day was added to the graduation requirements in the 2015-2016 academic year. We are seeing an increased number of student publications/presentations as a result.

Attachments

No items to display.

**Results: Evaluation of Thesis and Defense**

Goal/Objective/Outcome Number: Outcomes: 1, 2, 3

Results

The following table lists presents the average ratings for the nine questions asked in the **Oral Defense and Thesis Assessment Form**. This form has been in use since Fall of 2013



Survey Questions	2013-2014 (7 students evaluated)	2014-2015 (5 students evaluated)	2015-2016 (4 students evaluated)	2015-2016 (10 students evaluated)
1	3.59	3.75	3.83	3.68
2	3.61	3.63	3.53	3.71
3a	3.34	3.61	3.66	3.87
3b	3.52	3.61	3.73	3.64
3c	3.52	3.78	3.76	3.70
3d	3.46	3.69	3.77	3.62
3e	3.51	3.45	3.81	3.58
3f	3.54	3.8	3.79	3.52
3g	3.41	3.6	3.41	3.67

Attachments

No items to display.



Results: Record of Presentations and Publications

Goal/Objective/Outcome Number:

Results

The following table lists the number of MS students who either gave presentations and/or published scholarly papers.



Academic Year	Student Research Day	Publications
2016 - 2017	6	9
2015 - 2016	5	2
2014 - 2015	0	3
2013 - 2014	3	4
2012 - 2013	3	3
2011 - 2012	3	6
2010 - 2011	4	7

Attachments

No items to display.



Continuous Improvement

Goal/Objective/Outcome Number: 1-3

Program Changes and Actions due to Results

No specific improvements were identified this year.

Link to Assessment

Link to Flight Plan:



Assessment Plan Improvement

Improvements to Assessment Plan

Faculty participation in evaluation of student posters at Research Day event needs to increase.