# Institutional Effectiveness Report
## 2023-2024

**Program:** Electrical and Computer Engineering MS
**College and Department:** College of Engineering – Electrical & Computer Engineering
**Contact:** Indranil Bhattacharya, Professor and Interim Chair

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

**Attach Curriculum Map (Educational Programs Only):** A departmentally developed curriculum map can be found in Appendix 1 which shows the connections between courses and student learning outcomes.

### SLO 1 & 2: Clear understanding of the chosen area of emphasis

**Define Outcome**
SLO 1: Demonstrate a clear understanding of the chosen area of emphasis in electrical and computer engineering covered in the course material in the graduate program.

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

**Assessment Methods:**
1. *Completion of Master's Thesis or Independent Project/Comprehensive Exam:* 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 a minimum of 2 positive votes out of 3 or three-fourths of the committee members if there are more than 3 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.

2. *Evaluation of Thesis and Defense:* 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.

**Results and Analysis:**

Completion of Breadth Course and other Graduate Level Course Requirements

Achievement of student learning outcomes has been satisfactory based on the many student- authored class project reports, in-class assignments, journal publications, presentations, and quality of the MS Theses produced.

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

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 |
|---|---|
| 2023-2024 | 11 |
| 2022-2023 | 8 |
| 2021-2022 | 6 |
| 2020-2021 | 7 |
| 2019-2020 | 6 |
| 2018-2019 | 7 |

Evaluation of Thesis and Defense

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

*1   - shows little or no mastery of the sub-discipline*
*2   - shows marginal mastery of the sub-discipline*
*3   - shows basic mastery of the sub-discipline*
*4   - shows excellent mastery of the sub-discipline*

| Questions | 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 2023-24 |
|---|---|---|---|---|---|---|
| 1. Demonstrate mastery of the basic principles of at least one of the sub-disciplines of ECE. | 3.83 | 3.80 | - | 3.67 | 4.00 | - |
| 2. Apply these basic principles to solve advanced problems in their chosen sub-discipline | 4.00 | 3.80 | - | 3.33 | 4.00 | - |
| Number of students evaluated | 4 | 5 | - | 8 | 11 | - |

## SLO 3: Technical Competence

**Define Outcome:**

*SLO 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.*

**Assessment Methods:**

1. *Evaluation of Thesis and Defense*: 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.

2. *Record of Presentations and Publications:* 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. All MS students are required to either present a paper at a conference or participate in TTU Research Day as a graduation requirement.

**Results and Analysis:**

Evaluation of Thesis and Defense

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

*1 - shows little or no mastery of the sub-discipline*
*2 - shows marginal mastery of the sub-discipline*
*3 - shows basic mastery of the sub-discipline*
*4 - shows excellent mastery of the sub-discipline*

| Questions | 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 2023-24 |
|---|---|---|---|---|---|---|
| Content | 3.67 | 3.63 | - | 3.67 | 4.00 | - |
| Visual Aids | 3.83 | 3.76 | - | 3.33 | 4.00 | - |
| Presenter | 3.83 | 3.70 | - | 3.67 | 4.00 | - |
| Presentation mechanics | 3.83 | 3.77 | - | 3.67 | 4.00 | - |
| Responses to questions and comments | 3.67 | 3.70 | - | 3.67 | 3.83 | - |
| Quality of English | 3.83 | 3.73 | - | 3.67 | 3.83 | - |
| Technical writing content | 3.67 | 3.83 | - | 3.50 | 3.83 | - |
| Number of students evaluated | 4 | 5 | - | 8 | 11 | - |

Record of Presentations and Publications

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

| Academic Year | Student Research Day | Publications |
|---|---|---|
| 2020 – 2021* | - | - |
| 2019 – 2020* | 1 | 0 |
| 2018 – 2019* | 1 | 0 |
| 2017 – 2018* | 2 | 0 |
| 2016 – 2017 | 6 | 9 |
| 2015 – 2016 | 5 | 2 |

**Appendices**

1. Curriculum Map – Thesis Option
2. Curriculum Map – Non-Thesis Option

**Appendix 1: Curriculum Map – Thesis Option**

| ECE M.S. (Thesis): Curriculum Map | | | |
|---|---|---|---|
| Requirement | Student Outcomes | | |
| | SLO1: Content Knowledge | SLO2: Advanced Methods in ECE | SLO3: Professional Communications |
| ECE Graduate Breadth Courses (9 credits) | X | X | |
| ECE Elective Courses (6 credits) | X | X | |
| Elective Courses (some may be outside ECE) (9 credits) | X | | |
| ECE 6910: Intro to Graduate Research (1 credit) | | | X |
| ECE 6990: Research and Thesis (6 credits) | | X | X |
| ECE Publication or Presentation Requirement | | | X |

**Appendix 2: Curriculum Map**

| ECE M.S. (Non-Thesis): Curriculum Map | | | |
|---|---|---|---|
| | Student Outcomes | | |
| Requirement | SLO1: Content Knowledge | SLO2: Advanced Methods in ECE | SLO3: Professional Communications |
| ECE Graduate Breadth Courses (9 credits) | X | X | |
| ECE Elective Courses (12 credits) | X | X | |
| Elective Courses (some may be outside ECE) (9 credits) | X | | |
| ECE 6910: Intro to Graduate Research (1 credit) | | | X |
| ECE 6970: Non-Thesis Design Project (3 credits) | | X | X |