bioECE Track Graduate Curriculum ECE Department :: Advising Notes

Graduate advisor: Dr. David Soloveichik Website: <u>solo-group.link/members/david-soloveichik</u> Email: <u>david.soloveichik@utexas.edu</u>

Understanding, engineering, and interfacing with biological systems are among mankind's most important challenges, impacting numerous fields from basic science to health. Motivated by this larger vision, the bioECE track is focused on the intersection of electrical and computer engineering with biology and medicine. It includes such topics as biomedical instrumentation, biophotonics and imaging, health informatics and bioinformatics, neural engineering and computational neuroscience, and synthetic biology, among others.

The bioECE researcher applies ECE principles to the solution of problems of biological or medical origin. This is in contrast to Biomedical Engineering researchers in the sense that they solve specific problems of biological or medical origin using appropriate engineering and scientific principles, whichever the specific engineering discipline. The bioECE track is highly interdisciplinary with no required courses. Students often take courses in several departments including ECE, BME, CS, NEU, etc.

Table of Contents

Master's Degree Curriculum PhD Degree Curriculum Frequently Asked Questions

Master's Degree Curriculum

More information can be found in the Graduate Program Handbook: https://cloud.wikis.utexas.edu/wiki/spaces/ECEHandbook/overview

ECEx97C (Research Problems), ECE397K.1 (Conference Course), ECE397M (Internship), ECE398T (Teaching), or ECEx97G (Research Problems) do not count towards the MS degree.

Thesis Option: 8 courses; 4 to 6 courses in Major Work and 2 to 4 courses in Supporting Work, excluding ECE698A and ECE698B. You take ECE698A only once, and in a separate semester before taking ECE698B. You must take ECE 698B in the semester you file to earn the MS degree, even if you have to repeat it.

Report Option: 9 courses; 5 to 7 courses in Major Work and 2 to 4 courses in Supporting Work, excluding ECE 398R. You take ECE398R in the semester you file to earn the MS degree, even if you have to repeat it.

No-Thesis/No-Report Option: 10 courses: 5 to 8 courses in Major Work and 2 to 5 courses in Supporting Work.

Three MS Options		Number of Formal Courses Required			
		Major Work	Supporting Work		Total
		Total	Graduate	Total	Iotai
Thesis	ECE698A/B	4 to 6	1 or more	2 to 4	8
Report	ECE398R	5 to 7	1 or more	2 to 4	9
No Thesis or Report		5 to 8	1 or more	2 to 5	10
Min GPA Required		3.0	3.0	3.0	3.0

General course rules:

- 1) No more than 6 semester hours of upper-division undergraduate coursework may be included on the ECE MS Program of Work. No ECE required course can be counted on an MS plan of study.
- 2) For the No Thesis/No report option, at least 30 semester hours of formal classroom instruction is required. Formal classroom instruction excludes ECE397K.1 (Conference Course).
- 3) For the MS report option, at least 27 semester hours of formal classroom instruction, plus 3 hours of the report course (ECE398R) for a minimum total of 30 semester hours. Formal classroom instruction excludes ECE397K.1 (Conference Course).
- 4) For the MS Thesis option, at least 24 semester hours of formal classroom instruction, plus 6 hours of thesis courses (ECE698A, ECE698B) for a minimum total of 30 semester hours. Formal classroom instruction excludes ECE397K.1 (Conference Course).
- 5) No course of less than a grade of C and no more than one course with a grade of C or C+ may be included on the ECE MS Program of Work.

Undergraduate courses allowed for the Master's Degree:

- 1) The number of courses allowed does not depend on the thesis/report/NT-NR option
- 2) You must take the course for a letter grade
- 3) There is a limit of 2 total undergraduate courses allowed
- 4) There must be at least one graduate course in the supporting work category
- 5) A supporting work course cannot be required for all ECE undergraduates
- 6) It cannot be a 0x or 1x course number (i.e. it must be upper division)
- 7) It must be a class that students in that department use for their degree. It cannot be a survey class for non-majors.

Master's Thesis

The Master's Thesis is a more substantial undertaking than the Master's Report, described in the next section. The subject of the thesis may be either a research project or a substantial design project executed in close collaboration with a supervising professor. The supervising professor may be any member of the ECE Graduate Studies Committee (GSC), or under a co-supervision arrangement in order to work with other UT Austin faculty. The project need not be original research or design, but must have a substantial Electrical and Computer Engineering content. It takes approximately one whole semester to write a Master's Thesis. You must allow two weeks for your supervising faculty to read and edit each draft of your thesis. You should plan on three drafts, though it may not actually take that many drafts to finish. The standard Master's Thesis outline has four major components: (1) Introduction (review the state-of-the-art, the relevant literature and a clear definitive statement of your particular problem), (2) Methods (experimental, theoretical or numerical techniques, calibration methods, design criteria and constraints, performance evaluation processes, quality control processes, experiment design and the like), (3) Results (the experimental data that you measured, the final design embodiment, the results of numerical model calculations, performance measurements), and (4) Discussion. (What do the results mean? How does the design perform? What overall contribution have you made?)

Master's Report

There are two types of reports. A regular report is a project that typically takes 1 semester at 20 hours/week to complete. The scope ranges over engineering processes: research, design, implementation and/or evaluation. Reports, unlike theses, do not usually include all four of the above components. The second type of report is an industrial report, which is available only to full-time employees working in a Biomedical Engineering field. For this you must get approval from your boss at work and a professor at UT (a member of the ECE GSC, as above). You write a report about a project for which you made a major engineering contribution. You work out some way to convince the professor at UT that you personally performed enough design, implementation and testing to be classified as a major engineering design project without having to disclose into the UT library the company secrets. The official report may be short and contain general statements about the project. This report follows all format specifications defined by the University and is recorded in the library. If you perform all of the work at the outside company, then the University of Texas will not attempt to obtain ownership. On the other hand, if some of the creative ideas come from the professor, or if any of the design/development/testing occurs on campus, then this is not an industrial report and the usual collaborative arrangements will apply. Your boss at work and the professor at UT are co-supervisors of the industrial report.

PhD Degree Curriculum

A student who wishes to obtain a PhD degree in ECE/bioECE must go through three procedures: Candidacy Evaluation, Progress Review, Dissertation Defense. A student is considered in candidacy after successfully passing the Candidacy Evaluation.

The ECE PhD Rules and Procedures can be found in the Graduate Program Handbook: <u>https://cloud.wikis.utexas.edu/wiki/spaces/ECEHandbook/overview</u>

PhD Degree Course Requirements

There are no required courses for bioECE.

- At least 30 hours of "regular classroom instruction" at the graduate level (no individual instruction classes count towards the 30 hours of "regular classroom instruction"),
- At least 12 hours of the 30 should be taken in residence at UT-Austin (i.e., not transferred),
- "Supporting work": Should be "outside the principal area of study" (no requirement for inside or outside of the department; student's qualifying committee will examine the appropriateness of courses indicated as "supporting" or "major"),
- There should be at least as many "Major work" hours as "Supporting work" hours, with at least 6 hours for "Supporting work".

GPA in each category ("Major" and "Supporting") should be at least 3.5.

Frequently Asked Questions

Q: Are there any required courses for bioECE?

The bioECE PhD track is primarily a research track without any specific required courses. Students frequently take courses outside of ECE such as in BME or other departments. You should consult with your advisor if there are any particular courses they would like you to take or general areas that you should strengthen.

Q: How do I decide between placing a course in "major" versus "supporting" categories?

The goal is to avoid either of the following two extremes:

- (Breadth extreme) students who take random graduate classes in a variety of areas with no sufficient focus.
- (Depth extreme) students who only take graduate classes on their particular narrow topic. (This is harder to do in bioECE but possible for some areas like software engineering.)

We want students to get both breadth and depth in a particular topic. Major courses indicate your depth while supporting courses your breadth. Supporting work does not have to be concentrated in a single area.

Q: I am having trouble getting into a graduate class of my choice in another department

If you are having trouble registering for a graduate course outside of ECE, please note that departments often reserve some seats for their students. Typically for graduate courses this doesn't end up being a problem because enough people drop the course and seats open up. In my experience, students are generally able to get into the graduate courses of their choice in other departments, with a few exceptions of very popular courses such as machine learning or AI. I would suggest to start attending the course despite not being able to officially register at this time, and then at some point registration would open up.