



**Department of
Electrical & Computer Engineering**

Graduate Program Handbook

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**THE UNIVERSITY
OF ARIZONA**

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1. General Information

The Department of Electrical & Computer Engineering (ECE) at the University of Arizona (UA) offers master's and doctoral degrees in Electrical & Computer Engineering. This handbook only includes the additional policies and procedures that apply specifically to the ECE graduate program. Therefore, students must also refer to the documentation provided by the [UA Graduate College](#) for the policies and procedures that apply to all graduate students.

1.1 ECE Graduate Studies Office

Graduate Academic Advisor

The Graduate Academic Advisor assists in all aspects of the admissions process as well as helping students with the academic procedures for obtaining a graduate degree in ECE. The advisor may be contacted by email to GradAdvisor@ece.arizona.edu, by fax to 1-520-621-8076, or by postal mail to the following address:

Graduate Studies Office
Dept. of Electrical & Computer Engineering
The University of Arizona
P.O. Box 210104
Tucson, AZ 85721-0104

(For courier deliveries, the street address is 1230 E. Speedway Blvd.)

Director of Graduate Studies

The Director of Graduate Studies is appointed by the Dept. Head. The duties of the Director include the following:

- Chair the meetings of the ECE Graduate Studies Committee.
- Exercise reasonable discretion in the approval or denial of graduate applications, plans of study, transfer credits, and other student issues. A student's Faculty Advisor may appeal the Director's decision to the full Graduate Studies Committee. General policy issues or controversial student issues must be decided by the full Graduate Studies Committee.
- Appoint members to the Ph.D. Qualifying Exam committee.
- Work with the Assoc. Dept. Head to mediate any disputes between graduate students and faculty.
- Ensure that the ECE Graduate Handbook is available on the ECE web page and is kept current.
- Ensure that the ECE contents of the Graduate Catalog web page is kept current.
- Ensure that the electronic database of ECE graduate students is kept current.

ECE Graduate Studies Committee

The ECE Graduate Studies Committee (GSC) consists of the Director of Graduate Studies (who chairs the committee) appointed by the Dept. Head and additional faculty members appointed by the ECE department Committee on Committees. The Graduate Academic Advisor and an Associate Dept. Head serve as non-voting members of the committee. The primary function of the committee is to deal with recommendations from the faculty, and with curriculum development and other matters concerning graduate studies that involve the entire department. Activities include, but are not limited to

- The development of academic goals, policies, and procedures related to the graduate ECE program.
- Administering graduate academic policies and procedures (graduate admissions, approval of Plans of Study, etc.).

- Approval of student petitions for exceptions to ECE graduate policies.
- Continual review of the graduate curriculum, evaluation of the ability to meet the stated goals, and proposal of needed curricular revisions.

1.2 Graduate College

The [UA Graduate College](#) has a variety of campus-wide policies and procedures that apply to all students enrolled in the graduate program. The following online documentation is available from the Graduate College:

- [Admissions](#)
- Forms and publications
- [UA Graduate Catalog](#) (general policies and procedures)
- [Financial resources](#)
- Information and resources
- Multicultural programs
- Degree certification (policies and procedures for Qualifying Exam, Comprehensive Exam, Final Oral Defense, thesis/dissertation formatting, etc.)
- [Interdisciplinary programs](#)
- [Graduate and Professional Student Council](#)

1.3 Code of Academic Integrity

Integrity is expected of every student in all academic work. The guiding principle of academic integrity is that a student's submitted work must be the student's own. In particular, conduct prohibited by the UA Code of Academic Integrity consists of all forms of academic dishonesty, including, but not limited to: cheating, fabrication, facilitating academic dishonesty, and plagiarism as set out and defined in the [UA Student Code of Conduct](#); submitting an item of academic work that has previously been submitted without fair citation of the original work or authorization by the faculty member supervising the work; failure to observe rules of academic integrity established by a faculty member for a particular course; assisting another to violate this Code; and attempting to commit an act prohibited by this Code. Any attempt to commit an act prohibited by these rules shall be subject to sanctions to the same extent as completed acts.

For additional requirements and further information, please refer to the complete text of the [Code of Academic Integrity](#) available from the [Dean of Students](#) office.

1.4 Faculty Advisor

New students must obtain an *initial* Faculty Advisor prior to or at the beginning of the first semester of study. The initial Faculty Advisor will assist in selecting courses for the Draft Plan of Study. Students doing a thesis or dissertation must obtain a thesis/dissertation Faculty Advisor by the end of the second semester of study. The thesis/dissertation Faculty Advisor provides guidance in the selection of a research topic and supervises the research project. The Faculty Advisor will serve as the student's mentor, will assist the student in preparing the Plan of Study, and will help to ensure that the student is making satisfactory progress toward completion of the degree. The department realizes that it is sometimes in the best interest of the student to switch advisors. For example, a new student may have selected a Faculty Advisor, but later wants to accept an R.A. position from another faculty member. In such cases, ethical behavior requires that both the student and the new advisor consult with the first Faculty Advisor before making such a change. To change advisor, the student must obtain approval of the primary Faculty Advisor or the Director of Graduate Studies. The Graduate Studies Office will not proceed with the requested change without such approval. Students must submit the request to the Graduate Studies Office.

1.5 Changing Degree Option

To change degree or degree option, the student must obtain approval of the primary Faculty Advisor or the Director of Graduate Studies. The Graduate Studies Office will not proceed with the requested change without such approval. Students must submit the request to the Graduate Studies Office.

1.6 Petitions to the Graduate Studies Committee

This handbook includes the general policies and procedures for graduate degree programs in ECE. In rare cases, a student may have legitimate reasons for deviating from these general requirements. In such cases, the student may submit a petition to the ECE Graduate Studies Committee to request special consideration.

1.7 Minimum Registration for Funded Students

The College of Engineering has the following policy:

“All graduate students in the College of Engineering who are supported by or through the University are considered to be full-time students and are expected to enroll for some combination of coursework, research, or independent study that results in at least 9 units of credit each semester.”

1.8 English Proficiency for Teaching Assistants

The duties of graduate teaching assistants in ECE often include direct instructional contact. Therefore, international students whose native language is not English may have to pass an English Speaking Proficiency Evaluation in order to be eligible for a graduate teaching assistantship in ECE.

1.9 Cross-Listed Courses

Cross-listed courses are courses that are listed in the course catalogs of more than one department. The “home department” of a cross-listed course is the department by which the course is normally taught. A cross-listed course with an ECE home department is considered to be an ECE course, regardless of the section in which the student is enrolled.

1.10 Grade Replacement Opportunity

The UA Graduate College allows a grade replacement opportunity (GRO) for graduate students, subject to the approval of the student’s home department (regardless of the department in which the course is offered). However, the College of Engineering has recommended that departments routinely not approve such requests, as other mechanisms (incomplete grade, retroactive withdrawal, etc.) already exist for handling legitimate cases where a student is unable to adequately satisfy the requirements of a course. The Dept. of ECE agrees that this option is not needed and would lead to larger class sizes or the inability to accommodate all students wanting to register for particular classes, along with other potential adverse side effects. Thus, the Dept. of ECE policy is to not approve any GRO requests by graduate ECE students.

1.11 Non-Majors with Ph.D. Minor in ECE

Ph.D. students from other departments who wish to minor in ECE must complete at least 12 units of graduate ECE coursework. Independent-study courses are not normally allowed for satisfying this requirement. Split minors are allowed, provided that the student completes at least 6 units of graduate ECE coursework. Depending on the student’s background, additional courses may be required to compensate for undergraduate deficiencies. Such deficiency courses must be taken for credit, but may not be included in the Plan of Study.

Students must submit a Plan of Study by the end of the third semester of study and prior to scheduling the Comprehensive Exam. The minor Plan of Study must be approved by an ECE faculty member (the minor advisor) as well as by the ECE Graduate Studies Committee. Preferably, this should be done before enrolling in the minor courses, as these courses will not necessarily be approved after the fact.

There is no minor Qualifying Exam in ECE. The Minor ECE Written Comprehensive Exam is waived for non-ECE majors. The minor advisor and one additional (if required by the minor department) ECE faculty member (selected by the major and minor advisors) will serve on the oral Comprehensive Exam committee. The minor faculty members will also serve on the final oral defense committee, but they may waive their representation at the defense. Contact the ECE Graduate Studies Office for further information.

1.12 Optional Practical Training

International students may request Optional Practical Training. However, the Dept. of ECE does not normally approve OPT requests until after the student has completed writing the thesis/dissertation and any related papers, as well as all other degree requirements.

2. Admissions

2.1 Application Procedure

To apply for admission, students should submit a [UA Graduate Admissions Application](#) specifying Electrical and Computer Engineering as the desired graduate program. In addition, submit the following materials

- Official transcripts (India: Be sure that the transcript includes an official sum of total marks and marks obtained for each semester.)
- Official report of the Graduate Record Examination (GRE) General Test scores. (GRE Code: 1203). GRE results are not required for application to the master's degree program. Exceptions for the doctoral degree program requirement may be made for applicants who have completed a Bachelor of Science degree or Master of Science degree in ECE or a related field at a U.S. university.
- Official TOEFL results for international students. (TOEFL/INST Code: 4832)
- Resume, including a list of any published papers.
- A one-page summary of "Research Interests," identifying research areas of interest and career objectives.
- For master's degree applications, at least one letter of recommendation is required. For doctoral degree applications, three letters of recommendation are required and at least one of the letters must be from faculty from the student's master's program. There is no specific letter of recommendation form, so recommenders may use their own format, however letters must be written on institution letter head and must signed by the recommender.

Please note that **incomplete applications will be denied.**

Note that the Graduate College only processes applications with paid application fees. For other requirements and information concerning graduate admissions, see the [General Admissions Information](#) provided by the Graduate College.

2.2 Deadlines

Applications may be submitted at any time. However, please allow at least six weeks of processing time after all required documents have been submitted before an admission decision is made. Most applications

for Fall admission are received in December, admission decisions usually begin near the end of January, and offers of financial support usually begin near the end of February. After that time, the availability of financial support diminishes. Therefore, the recommended deadline for receipt of the application is as follows:

	Recommended Deadline for Applicants Seeking Financial Support
Spring	July 15
Summer	December 15
Fall	December 15

2.3 M.S. Minimum Admission Requirements

There are two options in the M.S. program: the thesis option and the non-thesis option. The M.S. thesis option provides knowledge, technical skills and research skills for career advancement and/or for subsequent work toward a Ph.D. degree. The non-thesis option is designed for the working professional in industry and offers knowledge and technical skills for career advancement.

The minimum admission requirements for the M.S. program are as follows:

- Bachelor’s degree from an institution recognized by the UA. Students who do not have a degree equivalent to the UA Bachelor of Science degree in Electrical & Computer Engineering may be admitted into the graduate ECE program, but may be required to complete some undergraduate deficiency courses prior to enrolling in graduate courses. This policy also applies to students in the M.S. non-thesis option. See the Graduate Handbook chapter regarding students with a non-ECE bachelor’s degree for further details.
- Grade-point average must be competitive.
- Applicants whose native language is not English are required by the Graduate College to submit a minimum TOEFL score of **550** (213 CBT). See the [UA Graduate Catalog](#) for a discussion of exemptions.
- Students in the M.S. non-thesis option are expected to be self-supported or supported by external fellowships or industry, and are not eligible for UA financial support, except for research assistantships provided by individual faculty.

2.4 Ph.D. Minimum Admission Requirements

There are two options in the Ph.D. program: the post-M.S. option and the direct option.

The minimum admission requirements for the Ph.D. program are as follows:

- Admission to the Post-M.S. Option requires a master’s degree in Engineering, Math, Physics, Computer Science, or Optics.
- Admission to the Direct Option requires a bachelor’s degree in Engineering, Math, Physics, Computer Science, or Optics. An exceptional record is required for admission into the Ph.D. Direct Option. This option is not available to students who have already completed at least one semester under the UA ECE master’s program. This option is not available to students who have already completed a master’s degree in Engineering, Math, Physics, Computer Science, or Optics.
- Grade-point average must be competitive.
- GRE scores must be competitive (incl. Verbal, Quantitative, and Analytical Writing). Exceptions may be made for applicants who have completed a Bachelor of Science degree or Master of Science degree in ECE or a related field at a U.S. university.

- Students who do not have a degree equivalent to the UA Bachelor of Science degree in Electrical & Computer Engineering may be admitted into the graduate ECE program but may be required to complete some undergraduate deficiency courses prior to enrolling in graduate courses. See the chapter regarding students with a non-ECE bachelor's degree for further details.
- Applicants whose native language is not English are required by the Graduate College to submit a minimum TOEFL score of **550** (213 CBT). See the [UA Graduate Catalog](#) for a discussion of exemptions.

3. Accelerated Master's Program

The Accelerated Master's Program (AMP) is designed to allow undergraduate seniors to work concurrently toward a master's degree. This option is appropriate for exceptional undergraduate students who would also like to pursue a graduate degree. By counting a limited number of courses toward both degrees, students can earn a M.S. degree much more quickly. The M.S. degree provides knowledge, technical skills and research skills for career advancement. This handbook only includes the additional policies that apply specifically to the AMP in ECE. Therefore, students must also refer to the policies and procedures for the Accelerated Master's Program in the UA General Catalog at <http://catalog.arizona.edu>, which applies to all graduate students. International students who may be interested in the ECE AMP program, and also in applying for OPT upon completion of their ECE BS degree, should first consult with the International Student Services office to obtain an understanding of current rules and regulations regarding OPT.

3.1 Admission Requirements

The basic admission requirements are defined by the Graduate College and are explained in the General Catalog at <http://catalog.arizona.edu>.

The basic admission requirements are modified by the Dept. of ECE as follows:

- Must be an undergraduate ECE student with at least 90 earned undergraduate units
- Must have a 3.3 cumulative undergraduate GPA to be admitted to AMP (see the following Academic Policies section regarding admission to M.S.)
- Must have a faculty mentor

3.2 Academic Policies

The AMP academic policies and tuition policies are defined by the Graduate College and are explained in the General Catalog at <http://catalog.arizona.edu>.

The basic academic policies are modified by the Dept. of ECE as follows:

- Once admitted to AMP, during the senior (or transition year), the student may take up to 12 units of 500-level graduate coursework which may apply toward both the bachelor's and the master's degrees.
- After completing at least 12 units of graduate coursework, the student must have a 3.2 cumulative undergraduate GPA and a 3.2 cumulative graduate GPA to be admitted to the M.S. program.

4. Master of Science Degree

There are two options in the M.S. program: the thesis option and the non-thesis option. The M.S. thesis option provides knowledge, technical skills and research skills for career advancement and/or for subsequent work toward a Ph.D. degree. The non-thesis option is designed for the working professional in industry and offers knowledge and technical skills for career advancement.

This handbook only includes the additional policies and procedures that apply specifically to the ECE graduate program. Therefore, students must also refer to the documentation provided by the [UA Graduate College](#) for the policies and procedures that apply to all graduate students. In particular, please note that the Graduate College requires that students registered in a program of study **must enroll continuously until the completion of the degree**. Students who do not register for one or more semesters will have to reapply for admission into the program and may be subject to new admission requirements.

4.1 Degree Requirements

Thesis Option

Coursework	Must submit the Draft Plan of Study by the end of first semester. 24 units of graduate coursework (5xx or 6xx)*, subject to the following limitations: <ul style="list-style-type: none">• A maximum of 3 units of ECE independent study. Non-ECE independent study does not apply toward the coursework requirement. ECE independent study must be taken with an ECE Faculty and must be pre-approved.• A maximum of 6 units of non-ECE coursework. All non-ECE coursework must be pre-approved by the Graduate Studies Committee prior to registration.
Paper**	Must submit at least one paper to a refereed conference or journal, with an ECE faculty member as a co-author.
Thesis	6 units of thesis (ECE 910).
Final defense	Must pass an oral defense of the thesis.

* A cumulative GPA of 3.0/4.0 or higher must be maintained on all coursework taken for graduate credit. A grade of C or higher is required for a course to be used to satisfy the degree requirements (A or B for transfer credits). The Grade Replacement Option (GRO) cannot be used for ECE graduate courses.

Non-Thesis Option

Coursework	Must submit the Draft Plan of Study by the end of first semester. 30 units of graduate coursework (5xx or 6xx)*, subject to the following limitations: <ul style="list-style-type: none">• A maximum of 3 units of ECE independent study. Non-ECE independent study does not apply toward the coursework requirement. ECE independent study must be taken with an ECE Faculty and must be pre-approved.• A maximum of 9 units of non-ECE coursework. All non-ECE coursework must be pre-approved by the Graduate Studies Committee prior to registration.
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* A cumulative GPA of 3.0/4.0 or higher must be maintained on all coursework taken for graduate credit. A grade of C or higher is required for a course to be used to satisfy the degree requirements (A or B for transfer credits). The Grade Replacement Option (GRO) cannot be used for ECE graduate courses.

4.2 Minor

The Dept. of ECE does not require a minor for the M.S. degree. However, students are strongly encouraged to include a breadth of topics in the study plan. The student's Faculty Advisor may require that the study plan include specific courses, including non-ECE courses, if it is necessary for the student's area of research.

Warning: Students who wish to pursue the Ph.D. degree following completion of the M.S. should carefully consider the policies regarding the Ph.D. minor when selecting their M.S. coursework. Up to 6 units of the Ph.D. minor may come from the M.S. coursework, if approved by the minor department. In general, the Dept. of ECE allows a split Ph.D. minor consisting of coursework from more than one department. In the case of a split minor, each sub-minor must consist of at least 6 units of coursework from the same department. However, ECE Ph.D. students with a non-ECE minor may be required by the minor department to take all 12 units of the minor in that minor department. So, students should consult with the minor department to determine whether the minor department has any such requirements.

4.3 Qualifying Exam

There is no Qualifying Exam for ECE master's students.

4.4 Draft Plan of Study

All students must consult with their initial Faculty Advisor and submit a Draft Plan of Study during the first semester of study. After being completed by the student, and recommended by the Faculty Advisor, the Draft Plan of Study must be submitted to the ECE Graduate Studies Office for approval by the Graduate Studies Committee. The Draft Plan of Study is an ECE form, which is used to facilitate an initial selection of courses by the student and Faculty Advisor. By seeking prior approval of the study plan, they will know whether the Dept. of ECE will allow the proposed courses to be counted toward the degree requirements. The student may submit a revised Draft Plan of Study for approval at any time. The study plan must also be approved by the Graduate College; this is the role of a subsequent form, the Plan of Study.

4.5 Plan of Study

All students must consult with their Faculty Advisor and submit a Plan of Study by the end of the third semester of study. After being completed by the student, and recommended by the Faculty Advisor, the Plan of Study must be submitted to the ECE Graduate Studies Office for approval by the Graduate Studies Committee. Upon submittal by the student, this form is forwarded to the Graduate College for their approval. Revisions of the Plan of Study are possible, but discouraged.

4.6 Thesis Defense

For the M.S. thesis option, there will be a final oral defense of the thesis. The defense will be administered by a committee of at least three tenure-track faculty members, recommended by the student's Faculty Advisor and approved by the Director of Graduate Studies, including at least two tenure-track faculty members with regular or joint appointments in the ECE department, and optionally including one tenure-track faculty member from another department. The student's Faculty Advisor will chair the committee.

The final draft of the thesis should be submitted to the Faculty Advisor at least six weeks prior to the oral thesis defense. Upon approval by the Faculty Advisor, and at least three weeks prior to the defense, the student must submit a thesis defense announcement, including the composition of the defense committee and an abstract of the thesis, to the ECE Graduate Studies Office for approval by the Director of Graduate Studies. The student should submit the final draft of the thesis, after it is has been approved by the Faculty Advisor, to the defense committee at least three weeks prior to the defense.

Each committee member shall indicate a pass or fail result. An abstention is counted as a negative vote, and two negative votes will result in failure of the defense. If the committee requires further thesis revisions as a condition of passing the defense, then the Thesis Revision Requirements form must be completed. The thesis defense may be attempted only twice. The second attempt will be observed by a non-voting representative of the Graduate College. The result of the second attempt will be determined by secret ballot.

4.7 Checklist for Satisfactory Academic Progress

Warning: All graduate students pursuing a M.S. degree in ECE must adhere to the following Satisfactory Academic Progress (SAP) guidelines. At the end of each semester, those students who have failed to comply with the SAP guidelines will receive a warning letter stating why they are in non-compliance. After receiving this warning letter, the student will have 30 days to submit in writing to the ECE Graduate Studies Office a plan for addressing their SAP non-compliance. Failure to submit an acceptable plan within the 30-day time limit will result in the issuance of a second SAP non-compliance warning letter to the student, with a copy of this letter also sent to the faculty advisor. If the student fails to fulfill the requirements for SAP within 30 days of receipt of the second non-compliance warning letter, then the non-compliant student will be reported to the Graduate College and may be switched to Provisional status or Non-Degree-Seeking (NDS) status. In order for an NDS student to be reinstated as an ECE student, that student will be required to reapply for admission and satisfy the admission requirements in effect at the time of reapplication. **Bold text** is used below to indicate information that must be submitted on time to the ECE Graduate Studies Office.

- Obtain an initial Faculty Advisor prior to or at the beginning of the first semester of study.
- During the first two weeks of the first semester of study, **complete the ECE Graduate Student Entry Checklist**.
- Consult with the initial Faculty Advisor and **submit a Draft Plan of Study** to the ECE Graduate Studies Office during the first semester of study.
- (Thesis option) Obtain a thesis Faculty Advisor by the end of the first semester of study and select a thesis research project.
- Consult with the Faculty Advisor and **submit the Plan of Study** to the ECE Graduate Studies Office by the end of the third semester of study.
- Complete all coursework in a timely manner, typically within two years for full-time students.
- A cumulative GPA of 3.0 or higher must be maintained on all coursework taken for graduate credit. A grade of C or higher is required for a course to be used to satisfy the degree requirements. The Grade Replacement Option (GRO) cannot be used for ECE graduate courses.
- (Thesis option) Select committee members for the oral thesis defense.
- (Thesis option) Submit the final draft of the thesis to the Faculty Advisor at least six weeks prior to the oral thesis defense.
- (Thesis option) After it has been approved by the Faculty Advisor, submit the final draft of the thesis to the defense committee at least three weeks prior to the defense.
- (Thesis option) Upon approval by the Faculty Advisor, and at least three weeks prior to the defense, the student must **submit a thesis defense announcement**, including the composition of the defense committee and an abstract of the thesis, to the ECE Graduate Studies Office for approval by the Director of Graduate Studies.
- (Thesis option) Complete the thesis and the oral thesis defense in a timely manner, typically within three years for full-time students.
- (Thesis option) **Submit a copy of the final thesis** to the ECE Graduate Studies Office. Follow all requirements of the Graduate College with regard to thesis submission procedures, formatting, and timelines.

- (Thesis option) **Submit a copy of the first page of the required conference or journal paper**, the name of the journal, and a copy of the submittal letter (with faculty signature) to the ECE Graduate Studies Office.
- **Submit the Master's/Specialist Completion of Degree Requirements form.**
- **Submit the ECE Graduate Student Exit Checklist.**

5. Doctor of Philosophy Degree

This handbook only includes the additional policies and procedures that apply specifically to the ECE graduate program. Therefore, students must also refer to the documentation provided by the [UA Graduate College](#) for the policies and procedures that apply to all graduate students. In particular, please note that the Graduate College requires that students registered in a program of study **must enroll continuously until the completion of the degree**. Students who do not register for one or more semesters will have to reapply for admission into the program and may be subject to new admission requirements. There are two options in the Ph.D. program: the post-M.S. option and the direct option.

5.1 Degree Requirements

Post-M.S. Option

Major Coursework	Must submit the Draft Plan of Study by the end of first semester. 36 units of graduate coursework (5xx or 6xx)* subject to the following limitations: <ul style="list-style-type: none"> • At least 12 units completed at the UA after an ECE, or equivalent, master's degree. • At least 9 units of UA ECE course work completed for a regular grade after an ECE, or equivalent, master's degree. • A maximum of 3 units of ECE 900 Research after the master's degree can be counted.
Minor Coursework	At least 9 units of graduate coursework (5xx or 6xx)*. subject to the following limitations: <ul style="list-style-type: none"> • Minors may be in Engineering, Math, Physics, Computer Science, Optical Sciences, or other areas approved by the Graduate Studies Committee. • All non-ECE coursework must be pre-approved by the Graduate Studies Committee prior to registration. • ECE 501B, ECE 502, and ECE 503 may not be included in the minor. • Independent study is not allowed in the minor. • Warning: Check with the minor department for possible additional restrictions.
Dissertation	18 units of dissertation (ECE 920).
Qualifying Exam	Consists of oral questions related to coursework. Must take this exam before the end of the 3rd semester. Warning: Cannot take the ECE Written Comprehensive Exam until 12 months after passing the Qualifying Exam.
Minor Written Comprehensive Exam	Must take this exam before taking the Oral Comprehensive Exam, which must be taken before the end of the 5th semester. The ECE Minor Written Comprehensive Exam is waived for ECE students.
ECE Written Comprehensive Exam	This is a written research proposal. Must be submitted to the Comprehensive Exam committee at least two weeks before the Oral Comprehensive Exam, which must be taken before the end of the 5th semester. Warning: Cannot take the ECE Written Comprehensive Exam until 12 months after passing the Qualifying Exam.
Oral Comprehensive Exam	This includes an oral presentation of the research proposal, questioning about the research proposal, and comprehensive technical questioning in the broader field related to the proposed research. Must be taken before the end of the 5th semester. Warning: Cannot take the Final Defense until 9 months after passing the Oral Comprehensive Exam.
Papers	Must submit at least two papers to a refereed journal (not counting papers submitted in the master's program), with an ECE faculty member as a co-author.
Final defense	Must pass an oral defense of the dissertation. Warning: Cannot take the Final Defense until 9 months after passing the Oral Comprehensive Exam.

* A cumulative GPA of 3.0/4.0 or higher must be maintained on all coursework taken for graduate credit. A grade of C or higher is required for a course to be used to satisfy the degree requirements (A or B for transfer credits). The Grade Replacement Option (GRO) cannot be used for ECE graduate courses.

Direct Option

Major Coursework	<p>Must submit the Draft Plan of Study by the end of 1st semester.</p> <p>36 units of graduate coursework (5xx or 6xx)* subject to the following limitations:</p> <ul style="list-style-type: none"> • At least 24 units must be completed at the UA. • A maximum of 3 units of ECE independent study. Non-ECE independent study does not apply toward the coursework requirement. • A maximum of 9 units of non-ECE graduate coursework. All non-ECE coursework must be pre-approved by the Graduate Studies Committee prior to registration. • A maximum of 6 units of ECE 900 Research can be counted. If receiving the M.S. non-thesis degree along the way, then only 3 units of ECE 900 may be counted.
Minor Coursework	<p>At least 9 units of graduate coursework (5xx or 6xx)* subject to the following limitations:</p> <ul style="list-style-type: none"> • Minors may be in Engineering, Math, Physics, Computer Science, Optical Sciences, or other areas approved by the Graduate Studies Committee). • All non-ECE coursework must be pre-approved by the Graduate Studies Committee prior to registration. • ECE 501B, ECE 502, and ECE 503 may not be included in the minor. • Independent study is not allowed in the minor. • Warning: Check with the minor department for possible additional restrictions.
Dissertation	18 units of dissertation (ECE 920).
Qualifying Exam	Consists of oral questions related to coursework. Must take this exam before the end of the 5th semester. Warning: Cannot take the ECE Written Comprehensive Exam until 12 months after passing the Qualifying Exam.
Minor Written Comprehensive Exam	Must take this exam before taking the Oral Comprehensive Exam, which must be taken before the end of the 7th semester. The ECE Minor Written Comprehensive Exam is waived for ECE students.
ECE Written Comprehensive Exam	This exam is a written research proposal. Must be submitted to the Comprehensive Exam committee at least two weeks before the Oral Comprehensive Exam, which must be taken before the end of the 7th semester. Warning: Cannot take the ECE Written Comprehensive Exam until 12 months after passing the Qualifying Exam.
Mid-Degree Paper	Prior to scheduling the Oral Comprehensive Exam, must submit a paper to a refereed journal or conference. Note: To receive an M.S. degree along the way, complete all M.S. degree requirements.
Oral Comprehensive Exam	This includes an oral presentation of the research proposal, questioning about the research proposal, and comprehensive technical questioning in the broader field related to the proposed research. Must be taken before the end of the 7th semester. Warning: Cannot take the Final Defense until 9 months after passing the Oral Comprehensive Exam.
Papers	Must submit a total of three technical papers with an ECE faculty member as a co-author: at least two papers to a refereed journal, and one additional paper to a refereed journal or refereed conference. This three-paper requirement includes the Mid-Degree Paper.
Final Defense	Must pass an oral defense of the dissertation. Warning: Cannot take the Final Defense until 9 months after passing the Oral Comprehensive Exam.

* A cumulative GPA of 3.0/4.0 or higher must be maintained on all coursework taken for graduate credit. A grade of C or higher is required for a course to be used to satisfy the degree requirements (A or B for transfer credits). The Grade Replacement Option (GRO) cannot be used for ECE graduate courses.

5.2 Minor

In order to provide breadth in the study program, the plan of study must include a “minor.” In general, the Dept. of ECE allows split minors consisting of coursework from more than one department. In the case of a split minor, a non-ECE sub-minor must consist of at least 6 units of coursework from the same department. However, students with a non-ECE minor may be required by the minor department to take 12 units of the minor in that minor department. So, students should consult with the minor department to determine whether the minor department has any such requirements.

The coursework for the minor may be in Engineering, Math, Physics, Computer Science, Optical Sciences, or other areas approved by the Graduate Studies Committee.

Any ECE coursework included in the minor must be chosen so that it contributes to breadth in the study plan.

Note that a cross-listed course with an ECE home department is considered to be an ECE course, regardless of the section in which the student is enrolled.

All non-ECE coursework must be pre-approved by the Graduate Studies Committee prior to registration.

5.3 Foreign Language Requirement

There is no foreign language requirement for ECE students.

5.4 Draft Plan of Study

All students must consult with their Faculty Advisor and submit a Draft Plan of Study during the first semester of study. After being completed by the student, and recommended by the Faculty Advisor, the Draft Plan of Study must be submitted to the ECE Graduate Studies Office for approval by the Graduate Studies Committee. The Draft Plan of Study is an ECE form, which is used to facilitate an initial selection of courses by the student and Faculty Advisor. By seeking prior approval of the study plan, they will know whether the Dept. of ECE will allow the proposed courses to be counted toward the degree requirements. The student may submit a revised Draft Plan of Study for approval at any time. The study plan must also be approved by the Graduate College; this is the role of a subsequent form, the Plan of Study.

5.5 Qualifying Exam

The qualifying exam consists of oral questions related to coursework. For the Post-M.S. Option, this exam must be taken before the end of the **3rd** semester of study. For the Direct Option, this exam must be taken before the end of the **5th** semester of study. Students with a non-ECE bachelor’s degree are allowed a one-semester delay if deficiency courses are needed. **Warning:** Students may not take the ECE Written Comprehensive Exam until **12 months** after passing the Qualifying Exam.

After submitting the Draft Plan of Study, the student should meet with his or her Faculty Advisor to discuss possible committee members for the Qualifying Exam. The Qualifying Exam will be administered by a committee of faculty members recommended by the student’s Faculty Advisor and approved by the Director of Graduate Studies. The committee shall include a total of three tenure-track faculty members with regular or joint appointments in the ECE department. The committee shall include two faculty members in the student’s proposed technical area and a third faculty member from a different ECE technical area to provide breadth. The student’s Faculty Advisor is one of the three members of the committee and will chair the committee. After meeting with the Faculty Advisor, the student will submit the names of the proposed

committee members to the Graduate Studies Office for approval by the Director of Graduate Studies prior to scheduling the exam.

The student should meet with each committee member prior to the exam to discuss appropriate review topics. The exam will be focused on fundamental knowledge in the undergraduate ECE curriculum, on the student's M.S. coursework including courses currently in progress, and on areas of background knowledge necessary to be successful in completing the coursework proposed in the Draft Plan of Study. If the committee discovers areas where the student's background knowledge is lacking, then the committee may require modifications to the proposed study plan.

The Qualifying Exam is conducted in closed session, not open to the public. This exam is an oral exam lasting at least one hour, but not more than three hours. The committee will vote by secret ballot. An abstention is counted as a negative vote, and two negative votes will result in failure of the exam. The results of the exam will be reported in writing, signed by all members of the exam committee, and submitted to the ECE Graduate Studies Office. The results include a written assessment of the Draft Plan of Study and a statement regarding any required modifications to the proposed study plan. If the exam is failed at the first attempt, then the student will be permitted a second attempt during the next regular semester. For the second attempt, the exam committee shall include at least one member from the first committee. The second committee will be given a copy of the written assessment by the first committee. A third attempt will not be allowed.

5.6 Plan of Study

All students must consult with their Faculty Advisor and submit a Plan of Study by the end of the third semester of study and prior to scheduling the Comprehensive Exam. After being completed by the student, and recommended by the Faculty Advisor, the Plan of Study must be submitted to the ECE Graduate Studies Office for approval by the Graduate Studies Committee and then by the Graduate College. Upon submittal by the student, this form is forwarded to the Graduate College for their approval. Revisions of the Plan of Study are possible, but discouraged.

5.7 Minor Written Comprehensive Exam

After completing the minor coursework and prior to the Oral Comprehensive Exam, each student must pass the Minor Written Comprehensive Exam. The exam is administered by the minor department. A student who fails the exam will be governed by the policies of the minor department. However, if the minor department defers to the Dept. of ECE, then the student may attempt the exam a second time, but a third attempt is not permitted. See the subsequent section, Conversion from Ph.D. Program, for further information. The ECE Minor Written Comprehensive Exam is waived for ECE students.

5.8 ECE Written Comprehensive Exam

The ECE Written Comprehensive Exam occurs after passing the Qualifying Exam and consists of a written research proposal. The written research proposal must be submitted to the Comprehensive Exam committee at least **two weeks** before the Oral Comprehensive Exam, which must be taken before the end of the **7th** semester. Students with a non-ECE bachelor's degree are allowed a one-semester delay if deficiency courses are needed. **Warning:** Students may not take the ECE Written Comprehensive Exam until **12 months** after passing the Qualifying Exam.

After submitting the Plan of Study, the student should meet with his or her Faculty Advisor to discuss possible committee members. The ECE Written Comprehensive Exam will be administered by a committee of faculty members recommended by the student's Faculty Advisor and approved by the Director of

Graduate Studies. The committee shall include three tenure-track faculty members with regular or joint appointments in the ECE department. After meeting with the Faculty Advisor, the student submits the names of the proposed committee members to the Graduate Studies Office for approval by the Director of Graduate Studies prior to scheduling the exam. The Written Comprehensive Exam and the Oral Comprehensive Exam are the two parts of the Comprehensive Exam. Thus, the faculty who serve on the Minor Written Comprehensive Exam committee and the ECE Written Comprehensive Exam committee will collectively serve on the Oral Comprehensive Exam committee.

The written research proposal will be no longer than 15 pages plus up to two additional pages for references. The following outline is recommended:

- Project title
- Abstract
- Research topic and its importance
- Review of current technology
- Motivation for new research (e.g., need better system modeling or performance; explain shortcomings of current technology)
- Proposed study/method/device
- Proposed experiments
 - Which prior technology to compare against?
 - How will the comparison be conducted?
 - How to measure performance?
- Risks and alternatives
- Resources needed
- Proposed schedule
- References

The student shall submit the ECE Written Comprehensive Exam to the Committee at least two weeks prior to the examination date for the Oral Comprehensive Exam. Exam committee members shall review the submitted proposal and will report to the candidate's dissertation director regarding any major or minor omissions or errors not later than during the Oral Comprehensive Exam. Minor revisions must be completed within 24 hours of successful completion of the Oral Comprehensive Exam for the student to be awarded a passing grade for the Comprehensive Exam (see Section 5.10 for details).

The need for significant corrections, as identified by two or more exam committee members, will constitute failure of the exam. An abstention is counted as a negative vote, and two negative votes will result in failure. If the written exam is failed at the first attempt, then the student will be permitted a second attempt, but a third attempt will not be allowed. See the subsequent section, *Conversion from Ph.D. Program*, for further information. For the second attempt, the exam committee shall include at least one member from the first committee in addition to the candidate's Faculty Advisor. Each member of the ECE Written Comprehensive Exam Committee shall report a pass or fail result for the written exam to the ECE Graduate Studies Office. An abstention is counted as a negative vote, and two negative votes will result in failure.

5.9 Mid-Degree Paper

For the Direct Option, the student must submit a paper to a refereed journal or conference prior to scheduling the Oral Comprehensive Exam. Note: To receive an M.S. degree along the way, the student must complete all M.S. degree requirements. The student must deliver a copy of the paper and the submission receipt to the ECE Graduate Studies Office.

5.9 M.S. Degree During D.Ph.D. Program

To receive an M.S. degree while enrolled in the D.Ph.D. program, the student must complete all degree requirements of the M.S. thesis option (including passing an oral defense of the thesis) or the M.S. non-thesis option. If the student elects to receive the M.S. non-thesis degree, then the student may count only 3 units of ECE 900 Research toward the D.Ph.D. major coursework requirements.

5.10 Oral Comprehensive Exam

The Oral Comprehensive Exam is taken after completing the Minor Written Comprehensive Exam and the ECE Written Comprehensive Exam. The Oral Comprehensive Exam must be taken before the end of the **5th** semester for the Post-M.S. option, and before the end of the **7th** semester for the Direct Option. Students with a non-ECE bachelor's degree are allowed a one-semester delay if deficiency courses are needed. **Warning:** Students may not take the Final Defense until **9 months** after passing the Oral Comprehensive Exam.

The Oral Comprehensive Exam will be administered by a committee of faculty members recommended by the student's Faculty Advisor and approved by the Director of Graduate Studies. The committee shall include three tenure-track faculty members with regular or joint appointments in the ECE department, and one tenure-track faculty member from each external minor department. If there is an ECE minor area, then one or more of the ECE faculty members of the committee should be able to represent that area. The Faculty Advisor will chair the committee.

The Oral Comprehensive Exam includes an oral presentation of the research proposal that comprised the Written Comprehensive Exam, questioning about the research proposal, and comprehensive technical questioning in the broader field related to the proposed research. The exam covers both the major and the minor. The student must display a broad knowledge of the chosen field of study and sufficient depth of understanding in areas of specialization. The student should prepare a 30-minute presentation about the research proposal, which allows additional time for questions.

The Application for Oral Comprehensive Examination for Doctoral Candidacy must be submitted to the ECE Graduate Studies Office at least three weeks before the oral exam. The written research proposal must be submitted to the committee at least two weeks before the Oral Comprehensive Exam.

The duration of the exam shall be a minimum of one hour and a maximum of three hours. As required by the Graduate College, in order to pass the exam, the student must demonstrate the professional level of knowledge expected of a junior academic colleague.

Each examiner shall indicate a pass or fail result for the oral exam. Final revisions to the written proposal must be completed within 24 hours of successful completion of the Oral Comprehensive Exam. The Faculty Advisor for the student shall confirm completion of all required revisions and shall report a pass or fail result for the Comprehensive Exam to the ECE Graduate Studies Office.

An abstention is counted as a negative vote, and two negative votes will result in failure. If the oral exam is failed at the first attempt, then the student will be permitted a second attempt during the next regular semester, but a third attempt will not be allowed. For the second attempt, the exam committee shall include at least one ECE member from the first committee in addition to the candidate's Faculty Advisor. See the subsequent section, Conversion from Ph.D. Program, for further information.

After passing the Oral Comprehensive Exam, the student should apply for advancement to doctoral candidacy.

Refer to the documentation provided by the [UA Graduate College](#) for additional policies and procedures that may apply.

5.11 Dissertation Defense

A final oral defense of the dissertation will be administered by an exam committee recommended by the student's Faculty Advisor and approved by the Director of Graduate Studies. The defense will be administered by a committee of at least three tenure-track faculty members, recommended by the student's Faculty Advisor and approved by the Director of Graduate Studies, including at least three tenure-track faculty members with regular or joint appointments in the ECE department, and optionally including one or two tenure-track faculty members from another department.

The final draft of the dissertation should be submitted to the Faculty Advisor at least six weeks prior to the oral dissertation defense. Upon approval by the Faculty Advisor, and at least four weeks prior to the defense, the student must submit the Announcement of Final Oral Exam to the ECE Graduate Studies Office. At least three weeks prior to the defense, the student must submit a dissertation defense announcement, including the composition of the defense committee and an abstract of the dissertation, to the ECE Graduate Studies Office for approval by the Director of Graduate Studies. The student should submit the final draft of the dissertation, after it has been approved by the Faculty Advisor, to the defense committee at least three weeks prior to the defense.

Each committee member shall indicate a pass or fail result. An abstention is counted as a negative vote. If the committee has only three members, then one negative vote will result in failure of the defense; otherwise, two negative votes will result in failure of the defense. The dissertation defense may be attempted only twice. The second attempt will be observed by a non-voting representative of the Graduate College. The result of the second attempt will be determined by secret ballot. See the subsequent section, Conversion from Ph.D. Program, for further information.

5.12 Conversion from Ph.D. Program

If a student in the Post-M.S. option does not pass a required exam, then the student will be converted to Non-Degree-Seeking status.

If a student in the Direct Option does not pass the Written Comprehensive Exam, then the student will be switched to the M.S. program, and the student must then satisfy all M.S. degree requirements.

If a student in the Direct Option has passed the Written Comprehensive Exam, but does not pass the Oral Comprehensive Exam or does not pass the Dissertation Defense, then the degree status will be changed to the M.S. program. An M.S. degree will be awarded to the student, provided that the student completes at least 30 units of coursework (excluding dissertation) toward the Ph.D. requirements, including completion of all M.S. degree requirements except for the thesis (see the chapter regarding the M.S. program). Such a student is generally not eligible for subsequent admission into the Ph.D. program.

5.13 Checklist for Satisfactory Academic Progress

Warning: All graduate students pursuing a Ph.D. degree in ECE must adhere to the following Satisfactory Academic Progress (SAP) guidelines. At the end of each semester, those students who have failed to comply with the SAP guidelines will receive a warning letter stating why they are in non-compliance. After

receiving this warning letter, the student will have 30 days to submit in writing to the ECE Graduate Studies Office a plan for addressing their SAP non-compliance. Failure to submit an acceptable plan within the 30-day time limit will result in the issuance of a second SAP non-compliance warning letter to the student, with a copy of this letter also sent to the faculty advisor. If the student fails to fulfill the requirements for SAP within 30 days of receipt of the second non-compliance warning letter, then the non-compliant student will be reported to the Graduate College and may be switched to Provisional or Non-Degree-Seeking (NDS) status. In order for an NDS student to be reinstated as an ECE student, that student will be required to reapply for admission and satisfy the admission requirements in effect at the time of reapplication. **Bold text** is used below to indicate information that must be submitted on time to the ECE Graduate Studies Office.

- Obtain an initial Faculty Advisor prior to or at the beginning of the first semester of study.
- During the first two weeks of the first semester of study, **complete the ECE Graduate Student Entry Checklist.**
- Consult with the initial Faculty Advisor and **submit a Draft Plan of Study** to the ECE Graduate Studies Office during the first semester of study.
- Obtain a dissertation Faculty Advisor by the end of the first semester of study and select a dissertation research project.
- Consult with the Faculty Advisor and **submit the Plan of Study** to the ECE Graduate Studies Office by the end of the third semester of study.
- **Pass the Qualifying Exam** before the end of the 3rd semester for the Post-M.S. Option or the 5th semester for the Direct Option. Students with a non-ECE bachelor's degree are allowed a one-semester delay if deficiency courses are needed.
- Complete the minor coursework and then **pass the Minor Written Comprehensive Exam.**
- Complete all coursework in a timely manner, typically within two years of full-time study for the Post-M.S. Option or three and a half years for the Direct Option.
- A cumulative GPA of 3.0 or higher must be maintained on all coursework taken for graduate credit. A grade of C or higher is required for a course to be used to satisfy the degree requirements. The Grade Replacement Option (GRO) cannot be used for ECE graduate courses.
- **Pass the ECE Written Comprehensive Exam** prior to the Oral Comprehensive Exam, which must be taken before the end of the 5th semester for the Post-M.S. Option or 7th semester for the Direct Option. Students with a non-ECE bachelor's degree are allowed a one-semester delay if deficiency courses are needed.
- **(Direct Option) Submit the Mid-Degree Paper.**
- **Pass the Oral Comprehensive Exam** before the end of the 5th semester for the Post-M.S. Option or the 7th semester for the Direct Option. Students with a non-ECE bachelor's degree are allowed a one-semester delay if deficiency courses are needed.
- After passing the Comprehensive Exam, **apply for advancement to candidacy.**
- Complete the dissertation research.
- Write the dissertation. The Graduate College has specific formatting requirements.
- Select committee members for the oral dissertation defense.
- Submit the final draft of the dissertation to the Faculty Advisor at least six weeks prior to the oral dissertation defense.
- After it has been approved by the Faculty Advisor, submit the final draft of the dissertation to the defense committee at least three weeks prior to the defense.
- Upon approval by the Faculty Advisor, and at least three weeks prior to the defense, the **student must submit a dissertation defense announcement**, including the composition of the defense committee and an abstract of the dissertation, to the ECE Graduate Studies Office.

- Complete the dissertation and the oral dissertation defense in a timely manner, typically within four years of full-time study for the Post-M.S. Option or five and a half years for the Direct Option.
- **Submit a copy of the final dissertation** to the ECE Graduate Studies Office. The Graduate College also requires the student to submit two copies of the final dissertation to the Graduate Degree Certification Office.
- **Submit a copy of the first page of the required journal papers**, the name of the journal(s), and a copy of the submittal letters (with faculty signature) to the ECE Graduate Studies Office.
- **Submit the ECE Graduate Student Exit Checklist.**

6. Students with Non-ECE Bachelor's Degree

Students who do not have a degree equivalent to the UA Bachelor of Science degree in Electrical & Computer Engineering may be admitted into the master's or doctoral program, but Ph.D. students may be required to complete some undergraduate deficiency courses prior to enrolling in graduate courses. Ph.D. students with a non-ECE bachelor's degree must satisfy at least three courses selected from the 3xx-level ECE courses that are required for the B.S. degree in either Electrical Engineering or Computer Engineering. Master's students are not required to complete any undergraduate deficiency courses, but are strongly encouraged to learn the material from the relevant undergraduate courses prior to enrolling in graduate courses. Determination of the specific core and elective deficiencies for Ph.D. students is done on an individual basis after admission into the ECE graduate program.

The list of required deficiencies for a particular Ph.D. student is determined by the student's Faculty Advisor, in consultation with the student, and must be submitted to the ECE Graduate Studies Office during the first semester. The Graduate Academic Advisor is then responsible for verifying that the deficiency courses have been completed. Although pre-requisite and co-requisite courses are not formally required for satisfying deficiencies, students are encouraged to take those courses for audit or credit; otherwise, students will need to learn the relevant material on their own time in order to successfully complete the required deficiency courses.

For Ph.D. students, three options are available for satisfying the undergraduate deficiencies:

- Complete the deficiency courses at the UA for undergraduate credit with a grade of B or better
- Provide evidence (transcript and a description of the course) of satisfactorily completing equivalent coursework at an institution recognized by the UA (graduate courses may not be used to satisfy undergraduate deficiencies)
- Receive course credit by examination (consult with the ECE Graduate Studies Office) if allowed.