

Graduate Handbook

**Department of
Electrical & Computer Engineering**

The University of Arizona

Revised October 14, 2009

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1. General Information

The Department of Electrical & Computer Engineering (ECE) at the University of Arizona (UA) offers three graduate degrees in Electrical & Computer Engineering: Master of Science (M.S.), Master of Engineering (M.Eng.), and Doctor of Philosophy (Ph.D.). 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](#) and by the [Tri-University Master of Engineering](#) program 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 a faculty member elected by each technical group. 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 technical groups, 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 (likewise for the M.Eng. project). 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 or to change degree status, 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 notify the Graduate Studies Office when selecting or changing the thesis/dissertation Faculty Advisor.

1.5 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. The petition form is included in the General Forms appendix.

1.6 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 12 units of credit each semester.”

1.7 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 must score at least 50 on the [Test of Spoken English](#) (TSE/SPEAK) in order to be eligible for a graduate teaching assistantship in ECE.

1.8 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.

1.9 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 where 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.

1.10 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 ECE coursework, of which no more than 6 units may be 4xx-level or dual-numbered as 4xx/5xx. 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 ECE coursework, of which no more than 3 units may be 4xx-level or dual-numbered as 4xx/5xx. 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. The form is included in the Doctoral Forms appendix.

There is no minor Qualifying Exam in ECE. 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 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.

1.11 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 the ECE Application for Graduate Admissions form (available in the Application Forms appendix) to the ECE Graduate Studies Office (see the contact information given above under the section, “ECE Graduate Studies Office”). In addition, mail the following materials to the ECE Graduate Studies Office:

- 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)
- 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.
- Three letters of recommendation. For M.S. and M.Eng. applications, letters are required only if seeking financial support or if the scores are marginal. For Ph.D. applications, 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.
- Next, submit the online Graduate College application form: [Graduate College Application Form](#).

Please note that **incomplete applications will not be evaluated**.

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

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 Engineering or 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 Graduate Handbook chapter regarding students with a non-ECE bachelor’s degree for further details.
- Grade-point average must be competitive.
- GRE scores must be competitive (incl. Verbal, Quantitative, and Analytical Writing).
- 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.

2.4 M.Eng. Minimum Admission Requirements

The M.Eng. program is designed to meet the educational needs of practicing engineers. Qualified students interested in later continuing to the Ph.D. program are urged to consider the M.S. instead of the M.Eng. program. The minimum admission requirements for the M.Eng. 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 Engineering or Computer Engineering may be admitted into the graduate ECE program, but such students may want to take extra undergraduate courses if needed to satisfy prerequisite requirements for graduate coursework. These undergraduate courses will not be counted toward the graduate degree requirements.
- Grade-point average must be competitive.
- GRE scores must be competitive (incl. Verbal, Quantitative, and Analytical Writing).
- Currently employed by a U.S. company in an engineering-related field.
- 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 this program are expected to be self-supported or supported by external fellowships or industry. M.Eng. students are not eligible for UA financial support.

2.5 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. 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).
- Students who do not have a degree equivalent to the UA Bachelor of Science degree in Electrical Engineering or 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. Master of Science 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.

3.1 Degree Requirements

Coursework	24 units of coursework [*] , subject to the following limitations: <ul style="list-style-type: none"> • At least 9 units must be graduate ECE courses that are not dual-numbered, not independent study, and not ECE 531. • A maximum of 12 units of 4xx/5xx dual-numbered ECE coursework (must enroll in the 5xx section). • A maximum of 3 units of ECE independent study. Non-ECE independent study is not allowed. • A maximum of 9 units of non-ECE coursework (must be in Engineering, Math, Physics, Computer Science, Optical Sciences, or other areas approved by the Graduate Studies Committee), including up to 6 units of 4xx coursework (must enroll in 5xx section if dual-numbered as 4xx/5xx). • All ECE coursework must be graduate-level.
Seminar**	1 unit of ECE 596A seminar (grades S & P are used in place of A & B, resp.). Also, must give at least one seminar presentation to ECE 696A.
Paper**	Must submit at least one refereed conference or journal paper, 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. The Grade Replacement Option (GRO) cannot be used for ECE graduate courses.

** The seminar and paper submission requirements apply to new students whose first semester of enrollment is Fall 2003 or later (including current UA students who change degree status to the M.S. program in ECE effective Fall 2003 or later).

3.2 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.

3.3 Qualifying Exam

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

3.4 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 form is included in the Master's Forms appendix. 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.

3.5 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. The form is included in the Master's Forms appendix. 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.

3.6 Thesis Defense

For the M.S. degree, 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 form is included in the Master's Forms appendix. The student should submit the final draft of the thesis, 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, 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 form is included in the Master's Forms appendix. 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.

3.7 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**, which is included in the General Forms appendix.
- 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. The form is included in the Master's Forms appendix.
- 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. The form is included in the Master's Forms appendix.
- Complete all coursework and the thesis research.
- 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.
- Write the thesis. The Graduate College has specific formatting requirements.
- The coursework and thesis must be completed in a timely manner, typically within two years for full-time students.
- Select committee members for the oral thesis defense.
- 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 form is included in the Master's Forms appendix.
- Complete the thesis and the oral thesis defense in a timely manner, typically within three years for full-time students.
- The student should submit the final draft of the thesis, after it has been approved by the Faculty Advisor, to the defense committee at least three weeks prior to the defense.
- Pass the thesis defense.
- **Submit a copy of the final thesis** to the ECE Graduate Studies Office. If microfilming the thesis (optional), then the Graduate College requires the student to submit two copies of the thesis to the Graduate Degree Certification Office.
- **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. The paper submission requirement applies to new students who first enrolled after January 1, 2003 (including current UA students who change degree status to the M.S. program in ECE after January 1, 2003).
- **Submit the Master's/Specialist Completion of Degree Requirements form**, which is included in the Master's Forms appendix.

- **Submit the ECE Graduate Student Exit Checklist**, which is included in the General Forms appendix.

4. Tri-University Master of Engineering Degree

For the working professional, the department offers the Tri-University Master of Engineering (M.Eng.) degree. This degree is offered as a collaboration of Arizona’s three state universities: the University of Arizona, Arizona State University, and Northern Arizona University. The graduate degree program is designed to meet the educational needs of practicing engineers by offering practice-oriented courses via distance delivery (e.g., web-based and video-campus courses). Students may take courses offered by any of the three partner universities (if pre-approved by the UA ECE Graduate Studies Committee), thereby taking advantage of the breadth of expertise available across the three campuses. Qualified students interested in later continuing to the Ph.D. program are urged to consider the M.S. instead of the M.Eng. program.

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](#) and by the [Tri-University Master of Engineering](#) program 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

At least 15 units (including the project if enrolled in the Project Option) must be taken at the UA. Here, “ECE coursework” is interpreted as “EEE coursework” at Arizona State University and “EE coursework” at Northern Arizona University.

Project Option

Major coursework	21 units of coursework [*] , subject to the following limitations: <ul style="list-style-type: none"> • At least 9 units (in addition to the applied math requirement) must be ECE courses that are not dual-numbered, not independent study, and not ECE 531. • A maximum of 12 units of 4xx/5xx dual-numbered ECE coursework (must enroll in the 5xx section). • A maximum of 3 units of ECE independent study. Non-ECE independent study is not allowed. • A maximum of 3 units of non-ECE coursework (must be in Engineering, Math, Physics, Computer Science, Optical Sciences, or other areas approved by the Graduate Studies Committee), which may include 4xx coursework (must enroll in 5xx section if dual-numbered as 4xx/5xx). • All ECE coursework must be graduate-level.
Applied math	3 units of approved graduate coursework in applied math.
Engineering management	3 units of approved graduate coursework in engineering management/business.
Practice-oriented project	3 units at the UA for a practice-oriented project (ECE 909).
Final	A satisfactory, oral presentation of the project. A written report may be required at

presentation	the discretion of the Faculty Advisor.
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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. The Grade Replacement Option (GRO) cannot be used for ECE graduate courses.

Non-Project Option

Major coursework	24 units of coursework*, subject to the following limitations: <ul style="list-style-type: none"> • At least 12 units (in addition to the applied math requirement) must be ECE courses that are not dual-numbered, not independent study, and not ECE 531. • A maximum of 12 units of 4xx/5xx dual-numbered ECE coursework (must enroll in the 5xx section). • A maximum of 3 units of independent study. Non-ECE independent study is not allowed. • A maximum of 3 units of non-ECE coursework (must be in Engineering, Math, Physics, Computer Science, Optical Sciences, or other areas approved by the Graduate Studies Committee), which may include 4xx coursework (must enroll in 5xx section if dual-numbered as 4xx/5xx). • All ECE coursework must be graduate-level.
Applied math	3 units of approved graduate coursework in applied math.
Engineering management	3 units of approved graduate coursework in engineering management / business.
Final exam	Must achieve a grade of B or better on the final exam of either a 6xx ECE course, or a 5xx ECE course having a prerequisite course at the 5xx level.

* 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. The Grade Replacement Option (GRO) cannot be used for ECE graduate courses.

4.2 Applied Math Courses

The following UA courses are recommended. Students may take other courses if recommended by the student's Advisory Committee and approved by the Graduate Studies Committee.

Course Number	Title
ECE 501	Linear Systems Theory
ECE 503	Random Processes for Engineering Applications

4.3 Engineering Management / Business Courses

The study plan must include coursework in engineering management / business. Not all courses in engineering management or business are allowed. Therefore, all coursework in the study plan must be pre-approved by the ECE Graduate Studies Committee and the M.Eng. Director for the College of Engineering.

4.4 Qualifying Exam

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

4.5 Advisory Committee

The student's Faculty Advisor will chair the Advisory Committee.

4.6 Draft Plan of Study

All students must consult with their Advisory Committee 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 form is included in the Master's Forms appendix. 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.

4.7 Plan of Study

All students must consult with their Advisory Committee 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. The form is included in the Master's Forms appendix. 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.

4.8 Project Presentation

For the M.Eng. Project Option, an oral presentation of the practice-oriented project is required. A written report may also be required at the discretion of the Faculty Advisor. The presentation will be evaluated by a committee of at least three 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 member from outside the department. The student's Faculty Advisor will chair the committee.

Upon approval by the Faculty Advisor, and at least three weeks prior to the presentation, the student must submit a project presentation announcement, including the composition of the committee and an abstract of the project, to the ECE Graduate Studies Office for approval by the Director of Graduate Studies. The form is included in the Master's Forms appendix.

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 project presentation. Students who fail the first attempt will normally be permitted a second attempt, unless a recommendation to the contrary is received from the exam committee. The committee members will normally be the same as for the first attempt, except that a non-voting observer, appointed by the Dept. Head, will also be present. Normally, a third attempt will not be allowed.

4.9 Checklist for Satisfactory Academic Progress

Warning: All graduate students pursuing a Master of Engineering degree in ECE at the UA 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 a Master of Engineering student in ECE, 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**, which is included in the General Forms appendix.
- 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. The form is included in the Master's Forms appendix.
- For the project option, obtain a project Faculty Advisor by the end of the first semester of study and select a practice-oriented 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. The form is included in the Master's Forms appendix.
- Complete all coursework.
- For the project option, complete the practice-oriented project.
- 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. The Grade Replacement Option (GRO) cannot be used for ECE graduate courses.
- For the project option, select committee members for the oral presentation of the practice-oriented project.
- For the project option, do a satisfactory, oral presentation of the practice-oriented project.
- **Submit the Master's/Specialist Completion of Degree Requirements form**, which is included in the Master's Forms appendix.
- **Submit the ECE Graduate Student Exit Checklist**, which is included in the General Forms appendix.

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	<p>36 units of graduate coursework*, including at least 12 units after an ECE master's degree. At least 24 units of major and minor coursework after an ECE master's degree. At least 12 units after the master's must be completed at the UA. The coursework after the master's is subject to the following limitations:</p> <ul style="list-style-type: none"> • At least 6 units must be ECE courses that are not dual-numbered, not independent study, and not ECE 531. • A maximum of 6 units of 4xx/5xx dual-numbered ECE coursework, including any dual-numbered ECE minor coursework after the master's (must enroll in the 5xx section). • A maximum of 3 units of ECE independent study. Non-ECE independent study is not allowed. • A maximum of 3 units of non-ECE coursework (must be in Engineering, Math, Physics, Computer Science, Optical Sciences, or other areas approved by the Graduate Studies Committee).
Minor	<p>12 units of coursework*, including at least 6 units after an ECE master's degree. At least 6 units after the master's must be completed at the UA. The minor coursework is subject to the following limitations:</p> <ul style="list-style-type: none"> • At least 6 units must be non-ECE coursework (must be in Engineering, Math, Physics, Computer Science, Optical Sciences, or other areas approved by the Graduate Studies Committee). • If there are two minor subjects, each minor must have at least 6 units of coursework. • A maximum of 6 units of non-ECE coursework may be 4xx-level, but the 5xx section must be selected if dual-numbered as 4xx/5xx. Otherwise, all coursework must be graduate-level. • ECE 501, ECE 502, and ECE 503 may not be included in the minor. • See the major requirements above for restrictions on dual-numbered ECE coursework. • Independent study is not allowed in the minor. • Check with the minor department for possible additional restrictions.
Preceptorship***	3 units of ECE 591 Preceptorship (practical experience developing teaching and communication skills)
Seminar**	1 unit of ECE 696A seminar (grades S & P are used in place of A & B, resp.), unless already included in UA master's coursework. Also, must give at least one seminar presentation to ECE 696A.
Dissertation	18 units of dissertation (ECE 920).
ECE Written Comprehensive Exam	Must pass this exam, taken before the end of the second semester.
Minor Written Comprehensive Exam	Must pass this exam, taken after completing all minor coursework.
Oral Comprehensive Exam	Must pass this exam, taken after completing the Minor Comprehensive Exam and 12 units of the post-M.S. major coursework requirements.
Paper*	Must submit a total of at least two refereed journal papers (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.

* 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. The Grade Replacement Option (GRO) cannot be used for ECE graduate courses.

** The seminar and paper submission requirements apply to new students whose first semester of enrollment is Fall 2003 or later (including current UA students who change degree status to the Ph.D. program in ECE effective Fall 2003 or later).

*** The preceptorship requirement applies to students whose first semester of enrollment is Spring 2010 or later (including current UA students who change degree status to the doctoral program effective Spring 2010 or later.)

Direct Option

Major	<p>36 units of graduate coursework*. At least 24 units must be completed at the UA. The coursework is subject to the following limitations:</p> <ul style="list-style-type: none"> • At least 24 units must be ECE courses that are not dual-numbered, not independent study, and not ECE 531. • A maximum of 12 units of 4xx/5xx dual-numbered ECE coursework, including any dual-numbered ECE minor coursework (must enroll in the 5xx section). • A maximum of 3 units of ECE independent study. Non-ECE independent study is not allowed. • A maximum of 9 units of non-ECE graduate coursework (must be in Engineering, Math, Physics, Computer Science, Optical Sciences, or other areas approved by the Graduate Studies Committee).
Minor	<p>At least 9 units of coursework*. At least 6 units must be completed at the UA. The minor coursework is subject to the following limitations:</p> <ul style="list-style-type: none"> • At least 6 units must be non-ECE coursework (must be in Engineering, Math, Physics, Computer Science, Optical Sciences, or other areas approved by the Graduate Studies Committee). • If there are two minor subjects, each minor must have at least 6 units of coursework. • A maximum of 3 units of non-ECE coursework may be 4xx-level, but the 5xx section must be selected if dual-numbered as 4xx/5xx. Otherwise, all coursework must be graduate-level. • ECE 501, ECE 502, and ECE 503 may not be included in the minor. • See the major requirements above for restrictions on dual-numbered ECE coursework. • Independent study is not allowed in the minor. • Check with the minor department for possible additional restrictions.
Preceptorship**	3 units of ECE 591 Preceptorship (practical experience developing teaching and communication skills)
Seminar	1 unit of ECE 696A seminar (grades S & P are used in place of A & B, resp.), unless already included in UA master's coursework. Also, must give at least one seminar presentation to ECE 696A.
Dissertation	18 units of dissertation (ECE 920).
ECE Written Comprehensive Exam	Must pass this exam, taken before the end of the second semester.
Minor Written Comprehensive Exam	Must pass this exam, taken after completing all minor coursework.
Mid-Degree Review	Must pass this review, taken prior to completing 27 units of the major coursework. Must either (1) write a paper for journal submission and pass an oral defense of the paper, or (2) complete all M.S. degree requirements and pass an oral defense of the thesis, receiving an M.S. degree along the way.
Oral Comprehensive Exam	Must pass this exam, taken after completing the Mid-Degree Review and 27 units of the major coursework requirements.
Paper	Must submit a total of at least two refereed journal papers, and one additional refereed journal or conference paper, with an ECE faculty member as a co-author.
Final Defense	Must pass an oral defense of the dissertation.

* 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. The Grade Replacement Option (GRO) cannot be used for ECE graduate courses.

** The preceptorship requirement applies to students whose first semester of enrollment is Spring 2010 or later (including current UA students who change degree status to the doctoral program effective Spring 2010 or later.)

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.

External (non-ECE) minors may be in another Engineering discipline, Math, Physics, Computer Science, Optical Sciences, or other areas approved by the Graduate Studies Committee.

An internal sub-minor is one that consists of graduate ECE coursework. In this case, the coursework of the internal sub-minor should be chosen so that it contributes to breadth in the study plan. At least 6 units of the minor must be non-ECE coursework.

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.

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 form is included in the Doctoral Forms appendix. 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

There is no qualifying exam.

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. The form is included in the Doctoral Forms appendix. 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 ECE Written Comprehensive Exam

The ECE Written Comprehensive Exam shall be taken before the end of the student's second semester of study. Students with a non-ECE bachelor's degree are allowed a one-year delay in order to satisfy any deficiency requirements.

(Students enrolled prior to Spring 2008 are permitted to delay the exam, but must take the exam no later than Spring 2009. Also, students admitted for Spring 2008 or Fall 2008 may delay the exam, but must take the exam no later than Spring 2009.)

(Students enrolled prior to Spring 2008 may elect to take the old-style, written comprehensive exam administered individually by faculty on the student's Comprehensive Exam committee. For such students, the oral Qualifying Exam is waived. See the old ECE Graduate Handbook, dated Jan. 25, 2006, for a description of the testing procedure for the old-style written exam. Students who opt for one format of the exam on their first attempt must use the same format on their second attempt.)

The exam will be administered by a committee of three tenure-track faculty members with regular or joint appointments in the ECE department, recommended by the student's Faculty Advisor and approved by the Director of Graduate Studies. The student's Faculty Advisor shall not be a member of the exam committee. The Director of Graduate Studies shall appoint one of the committee members to serve as chair.

The student's Faculty Advisor, in consultation with the student, selects a topic for the ECE Written Comprehensive Exam. The topic shall be significantly different from the student's previous work. For example, "geographical routing in wireless networks" has the appropriate scope for a topic, but "wireless networks" is too broad. The requirements for the ECE Written Comprehensive Exam are as follows:

- Select three important journal papers on the selected topic (frequently cited papers, award-winning papers, etc.). Submit the proposed papers to the committee, along with an abstract of the connections between the papers that the student will explore. The selected papers must be approved by the exam committee prior to writing the report.
- Write a report on the selected topic with the aid of the selected papers. The report may be up to 15 pages in total length and shall use a 12-point font size.
- The report must be written solely by the student, with no editing by others. Plagiarism is not permitted. For a discussion of how to avoid plagiarism, refer to resources such as the following UA Library tutorial: <http://www.library.arizona.edu/help/tutorials/plagiarism>.
- Give a 15-20 minute talk to the whole committee in order to discuss the details of the report. The talk/discussion period is limited to a maximum of 90 minutes.
- The report must be more than just a simple review of other people's work, but should also include an in-depth discussion of the student's own thoughts on what future research could or should be done on this topic.

Each examiner shall indicate a pass or fail result for the overall written exam. An abstention is counted as a negative vote, and two negative votes will result in failure. The result of the exam is reported on the

ECE Written Comprehensive Exam form (available in the Doctoral Forms appendix), which is then submitted to the ECE Graduate Studies Office, along with a copy of the student's report.

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 three-member committee will include one member from the first committee and two new members. The second committee will be given a copy of the student's first report as well as the corresponding written assessment by the first committee.

5.8 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 will not be permitted. See the subsequent section, Conversion from Ph.D. Program, for further information. The ECE Minor Written Comprehensive Exam is waived for ECE students.

5.9 Mid-Degree Review

For the Direct Option, the student must pass a Mid-Degree Review, taken after completing the ECE Written Comprehensive Exam and the Minor Written Comprehensive Exam, and taken prior to completing 27 units of the major coursework requirements and prior to the Oral Comprehensive Exam. There are two methods for completing this requirement:

- Write a paper for journal submission and pass an oral defense of the paper. The Mid-Degree Review 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 duration of the exam shall be a minimum of one hour and a maximum of three hours. 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 Mid-Degree Review. The result of the Mid-Term Review is reported on the Mid-Term Review form (available in the Doctoral Forms appendix), which is then submitted to the ECE Graduate Studies Office. A student who fails this review will be permitted a second attempt. See the subsequent section, Conversion from Ph.D. Program, for further information.
- Or complete all M.S. degree requirements (for details, see the chapter regarding the M.S. degree) and pass an oral defense of the thesis, receiving an M.S. degree along the way.

5.10 Oral Comprehensive Exam

The Oral Comprehensive Exam is taken after completing the ECE Written Comprehensive Exam and the Minor Comprehensive Exam. For the Post-M.S. Option, the Oral Comprehensive Exam is taken as soon as possible after completing the Minor Written Comprehensive Exam and 12 units of the post-M.S. major coursework requirements. For the Direct Option, the exam is taken as soon as possible after completing the Mid-Degree Review and 27 units of the major coursework requirements. The exam will be administered by a committee of tenure-track faculty members, recommended by the student's Faculty Advisor and approved by the Director of Graduate Studies, including three or four tenure-track faculty members with regular or joint appointments in the ECE department, and including one or two tenure-track faculty members from the external minor department(s). The Faculty Advisor will chair the committee.

The Application for Oral Comprehensive Examination for Doctoral Candidacy, which is included in the Doctoral Forms appendix, must be submitted to the ECE Graduate Studies Office at least three weeks before the oral exam. Along with this form, the student shall submit a one- or two-page summary of the expected dissertation research topic.

The student should meet with each examiner prior to the exam to discuss appropriate review topics. A brief (e.g., 15 minute) discussion of the proposed dissertation research may be included as part of the oral 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. 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. 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. The form is included in the Doctoral Forms appendix.

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. The form is included in the Doctoral Forms appendix. 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 form is included in the Doctoral Forms appendix. 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 or does not pass the Mid-Degree Review, 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 and the Mid-Degree Review, 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 seminar and 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**, which is included in the General Forms appendix.
- 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. The form is included in the Doctoral Forms appendix.
- Pass the ECE Written Comprehensive Exam before the end of the second semester of study. Students with a non-ECE bachelor's degree are allowed a one-year delay in order to satisfy the deficiency requirements.
- 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. The form is included in the Doctoral Forms appendix.
- Complete the minor coursework and then pass the Minor Written Comprehensive Exam.
- Complete the Mid-Degree Review upon completing the designated amount of coursework.
- Complete the 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.
- After completing the designated amount of coursework, take the Oral Comprehensive Exam. Consult with the Faculty Advisor to select a committee. The **application form for the Comprehensive Exam** is included in the Doctoral Forms appendix.
- After passing the Comprehensive Exam, **apply for advancement to candidacy**. The form is included in the Doctoral Forms appendix.
- Complete the dissertation research.
- Write the dissertation. The Graduate College has specific formatting requirements.
- Select committee members for the oral dissertation defense.
- 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.
- 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 three weeks prior to the defense, the student must **submit the Announcement of Final Oral Exam**. The form is included in the Doctoral Forms appendix.
- 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. The form is included in the Doctoral Forms appendix.
- 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.
- Pass the oral dissertation defense.
- **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. The paper submission requirement applies to new students who first enroll after January 1, 2003 (including current UA students who change degree status to the Ph.D. program in ECE after January 1, 2003).
- **Submit the ECE Graduate Student Exit Checklist**, which is included in the General Forms appendix.

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 Engineering or Computer Engineering may be admitted into the M.S. or Ph.D. program, but may be required to complete some undergraduate deficiency courses prior to enrolling in graduate courses. Determination of the specific core and elective deficiencies is done on an individual basis upon application for admission to the ECE graduate program. For the M.Eng. program, no specific deficiencies must be satisfied, but students may want to take extra undergraduate courses (which will not be counted toward the graduate degree requirements) if needed to satisfy prerequisite requirements for graduate coursework.

The list of elective deficiencies 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 form is included in the General Forms appendix. The Graduate Academic Advisor is then responsible for

verifying that the core and elective deficiencies 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.

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.

6.1 Core Deficiencies

All three of the following core courses must be satisfied:

Course Number	Title	Credit Units
ECE 274	Digital Logic	3
ECE 340	Engineering Systems Analysis	3
ECE 351A	Electronic Circuits	3

6.2 Elective Deficiencies

Two of the following elective courses must be chosen in consultation with the student's Faculty Advisor and submitted to the ECE Graduate Studies Office:

Course Number	Title	Credit Units
ECE 275 (or C SC 227)	Comp. Programming for Engr. Appl.	3
C SC 227 (or ECE 275)	Program Design and Development	4
ECE 304	Design of Electronic Circuits	6
ECE 352	Device Electronics	3
ECE 369	Fundamentals of Computer Arch.	3
ECE 372	Microprocessor Organization	3
ECE 381	Introductory Electromagnetics	3
C SC 342	Data Structures and Algorithms	3
MATH 322	Mathematical Analysis for Engr.	3

Appendix A: Application Forms

**ECE Application for Graduate Admission
Graduate Application**

Appendix B: General Forms

**ECE Graduate Student Entry Checklist
ECE Deficiencies
ECE Independent Study
ECE Petition to ECE Graduate Studies Committee
ECE Graduate Student Exit Checklist**

Appendix C: Master's Forms

**ECE Master's Draft Plan of Study
Master's/Specialist Plan of Study
ECE Thesis Defense Announcement
ECE Thesis Revision Requirements**

**ECE M.Eng. Project Presentation Announcement
Master's/Specialist Completion of Degree Requirements**

Appendix D: Doctoral Forms

**ECE Doctoral Draft Plan of Study
Doctoral Plan of Study
ECE Written Comprehensive Exam
ECE Mid-Degree Review
Application for Oral Comprehensive Exam for Doctoral Candidacy
Committee Appointment Form (Formally Advancement to Candidacy)
ECE Announcement of Dissertation Defense
Announcement of Final Oral Exam**