Doctor of Philosophy Degree Requirements

I. INTRODUCTION

The recipient of a Ph.D. degree in Electrical and Computer Engineering (ECE) has demonstrated critical thinking and powers of imaginative synthesis, as evidenced by original contributions to knowledge in his or her chosen field of study in ECE.

Formal requirements for the degree are completion of an approved Doctoral Program of Study, satisfactory performance on the Doctoral Preliminary Evaluation and Doctoral Qualifying Examination, completion of an acceptable Doctoral dissertation, an ECE Doctoral exit seminar, and satisfaction of a residency requirement.

Students without an M.S. degree are automatically admitted to the Ph.D. program after passing the Doctoral Preliminary Evaluation.

II. Ph.D. PROGRAM

A. Doctoral Program of Study

Doctoral students must acquire both a broad knowledge of the theoretical and practical aspects of their field of study, and in depth knowledge in a specialty area within their field. A Doctoral Program of Study must contain (exclusive of EEC 29X seminar series and EEC 299 courses) at least 45 units of graduate and upper-division undergraduate courses not including any course required for the ECE undergraduate degree of any of the following courses: EEC100, EEC110A/B, EEC130A/B, EEC140A/B, EEC150A/B, EEC170, and EEC180A/B. At least 24 units must be from the ECE discipline and at least 9 units must be from outside the ECE discipline. Among the total number of units listed in the Program of Study, at least 24 units must be taken at the Davis campus. For courses listed on the Program of Study, a grade point average of at least 3.5 is required. The doctoral program of study may include courses taken in a master's program.

In-depth knowledge can usually be obtained by completion of at least 30 units, of which 21 must be from graduate courses, in one speciality area, the major. The requirement of breadth may be obtained by the completion of at least 15 units, of which 9 must be from graduate courses, in another area, the minor. The courses in the minor should form a coherent set which complements the major. Examples of appropriate minors are: a subfield within the ECE program, computer science, mathematics, statistics, and physics.

A Doctoral Program of Study must be approved by the Major Professor, the PhD Guidance Committee, the ECE Graduate Advisor, and the ECE Graduate Study Committee. The Doctoral Program of Study form must be completed and submitted within the first 7 days of the Fall quarter immediately following the passing of their
**Doctoral Preliminary Examination.**

All graduate students are required to take EEC290, ECE Graduate Student Seminar each Fall Quarter.

### B. Doctoral Preliminary Evaluation Process

The purpose of the Ph.D. preliminary evaluation process is to determine a student's potential for independent research. All students are encouraged to take the preliminary evaluation as soon as possible after entry into the graduate program. Students admitted to the Ph.D. program who already have an M.S.E.E. must pass the preliminary evaluation within two years of admission. Students not in possession of an M.S.E.E. when admitted must pass the evaluation within their first three years. To participate in the Ph.D. Preliminary Evaluation Process, students must have full-time status and be in good academic standing. Students may not participate in the evaluation more than twice.

The Ph.D. preliminary evaluation process has two components: an oral examination and a research dossier. Each preliminary evaluation period starts in the Winter quarter and concludes by the end of Spring quarter.

1. **The Oral Examination**

   The preliminary examination is an oral examination that takes place within the first three weeks of Winter Quarter each year. The examination will be given by two faculty members in each of the following six areas: (1) physical electronics, (2) signals and systems, (3) electromagnetics, (4) active and passive circuits, (5) systems and software, and (6) digital systems. The student will be evaluated in three of the six areas. The student may elect to be evaluated in more than three areas; however, only the top three scores will be considered. The faculty examiners will restrict themselves to questions on the topics described in the handout "Preliminary Examination Topics" which will be available during the Fall Quarter. Nevertheless, since the purpose of the examination is to assess research potential, the questions may be significantly less structured than questions on written examinations, and the follow-up questions may range over a broad spectrum of related material.

   Each of the two examiners present will assign a grade from 1 to 4. Generally, 1 means a clear fail, a 2 means a marginal fail, a 3 means a marginal pass, and a 4 means a clear pass. A total score of 24 is possible. The following determinations are made from the total scores of:

   a. 18-24 is defined as a "Clear Pass." A short version of the Dossier must be submitted by the student.

   b. 14-17 is defined as "Intermediate Pass" provided the student has met one or both of the following criteria:

      - Minimum UC Davis GPA of 3.5,
      - Passing score of at least 5 in two of the areas tested.

   A Dossier must be submitted by the student.
c. 13 or less is defined as a "Clear Fail." Students in this category have failed the Ph.D. Evaluation and cannot submit a dossier.

2. Dossier

Dossiers will be due within 10 weeks of the conclusion of the exam on a date determined by the preliminary exam committee. The dossier is the responsibility of the student, but must be prepared with the advice and approval of the Major Professor. In the case of incoming graduate students who have not selected a Major Professor, they should consult with the Vice Chair for Graduate Studies.

For students who receive a "Clear Pass" on the examination, the dossier need only contain a letter from the student's Major Professor indicating this advisor's willingness to supervise the student, together with a list of courses taken as a graduate student at UC Davis with grades received.

For students who receive an "Intermediate Pass" on the examination, the dossier should contain, in addition to the letter and grades, any material that provides evidence of the student's potential to perform high-quality independent research. Typical items to include in the dossier are transcripts, summaries of research already completed (e.g., a Master's project or research performed in industry), copies of any papers submitted or accepted for publication, and summaries of research in progress. Students must clearly indicate their individual contribution to each item presented.

The Ph.D. Preliminary Evaluation Committee will make a recommendation on each case to the ECE faculty. An ECE faculty vote will determine the final outcome. Students will be notified of the final outcome, in writing, as soon as possible, but no later than the end of Spring quarter.

C. Doctoral Qualifying Examination

The purpose of the Doctoral Qualifying Examination is to determine the student's preparation to pursue his or her proposed research. It should be scheduled at the time when the student has completed all of the necessary course work and the preparation for doctoral research.

To be eligible for examination, the student must have completed all courses in their approved Doctoral Program of Study and remedial requirements (if applicable), and passed the Doctoral Preliminary Evaluation. A grade point average of at least 3.5 in courses on the Ph.D. Program of Study is required. At least one month before the qualifying examination is taken, a student must contact an ECE Graduate Advisor who will confirm that all the PhD course requirements have been met and the selection of a PhD Qualifying Examination Committee will be initiated.

Students must have full-time status during the quarter in which they take their Qualifying Examination. The Qualifying Examination must be taken as soon as coursework has been completed. In no instance can the exam be taken later than two quarters before the completion of the doctoral program. The student must submit a research proposal to each committee member. The format of the research proposal is flexible, but the proposal should clearly indicate the problem under study, the progress
made toward a "solution," the work remaining to be done, and the methods to be used in the remainder of the work. The oral examination will focus on the major and minor areas of the student's Doctoral Program of Study. The examination is not strictly limited to these areas, as the examination is intended to test the student's mastery of a large field of knowledge and potential for scholarly research, which is generally broader than the dissertation field.

The doctoral qualifying examination may be used to fulfill certain requirements for the MS Plan II degree; see Master of Science Degree Requirements.

D. Advancement to Candidacy

Within one month after successful completion of the qualifying examination, the student must file an application for advancement to candidacy. This application must be routed through the ECE Graduate Program Coordinator for the ECE Graduate Advisor's approval and then must be filed with Graduate Studies.

E. Doctoral Dissertation

The doctoral dissertation should be an original and substantial contribution to knowledge in the student's major field. It must demonstrate the ability to carry out a program of original research and to report the results in accordance with standards observed in recognized scientific journals. ECE requires an exit seminar. The exit seminar is open to the public. At least 3 members of the Ph.D. Reading Committee or the Qualifying Examination Committee must be in attendance.

A Ph.D. dissertation will be prepared, submitted and filed according to information found at the Office of Graduate Studies web site. The dissertation is filed with the Office of Graduate Studies. One copy is given to the ECE Graduate Program Coordinator.

III. MAJOR PROFESSOR AND ADVISING COMMITTEES

A. Major Professor Selection

The student must select a Major Professor from the members of the ECE Graduate Program as soon as possible, but no later than start of the third quarter of enrollment. In the case of a change in Major Professor, signatures of the previous and new major professor are required acknowledging the change. The Vice Chair for Graduate Studies will serve as the interim advisor to the new students during the process of selecting a major professor.

B. Doctoral Guidance Committee

The student must declare a PhD Guidance Committee after passing the PhD Preliminary Evaluation. This committee is chaired by the Major Professor and is made up of at least two other members. The majority of this committee must be members of the ECE Graduate Program. The responsibility of this committee is to guide the student through their program of study until the PhD Qualifying Examination is taken.

C. Qualifying Examination Committee
The Qualifying Examination Committee consists of five faculty members appointed by
the Dean of the Graduate Studies, including at least one from the student's minor area.
The majority of this committee must be members of the ECE graduate program. At least
one member must be from outside the ECE graduate program. The chair must be
someone other than the student's Major Professor.

D. PhD Dissertation Reading Committee

After advancing to candidacy the student will declare a PhD Dissertation Reading
Committee. The chair of this committee is the student's Major Professor. It consists of at
least three members whose task is to read the PhD dissertation and approve its technical
content and presentation. The majority of this committee must be members of the ECE
graduate program. At the advice of the Major Professor the ECE Graduate Advisor will
nominate the committee.

IV. RESIDENCE AND SCHOLARSHIP

A. Residence Requirement

All full-time students must be enrolled in a minimum of 12 units each quarter. For the
Ph.D. degree, the student must be in residence for a minimum of six quarters. Residence
for the master's degrees cannot be used to satisfy requirements for a doctoral degree.

The student is in academic residence when enrolled in at least four units of approved
upper-division or graduate courses, including research courses. Two regular six-week
summer sessions may be counted as the equivalent of one quarter, provided that the
student is enrolled in at least two units during both sessions. Arrangements can be made
to satisfy part of a residence requirement by study on another campus of the University
of California.

B. Satisfactory/Unsatisfactory Grading Option

Students working toward a PhD degree are not permitted to take any courses, normally
offered for grade, on a Satisfactory/Unsatisfactory basis.

C. Standards of Scholarship

1. Only courses in the 100 and 200 series in which the student receives grades of
"A", "B", or "S" (29X series) may be counted in satisfaction of the requirements
for the Ph.D. degree. A course in which a student receives a "C+" or lower cannot
be used to satisfy the unit requirement for the Ph.D. degree but will count in
determining the grade point average.

2. Candidates are required to maintain a grade point average of at least 3.0 in all
upper division and graduate courses taken during their residence as graduate
students at the University of California. For coursework used in Ph.D. Program of
Study, a grade point average of 3.5 is required.

3. The ECE Department does not normally permit graduate students to repeat a
course for credit. In unusual circumstances, a student may be permitted to repeat a
course for credit in accordance with campus regulations, which allow graduate
students to repeat up to nine units of courses in which a grade of C, D, F, or U was received.

D. Requirements for Students Not Holding an Electrical Engineering Degree

Students with a background other than electrical or computer engineering will meet with the ECE Graduate Advisor during their first quarter of residence to determine the required sequence of remedial courses. Students must demonstrate competency by completing the remedial course requirements, obtaining a grade of B or better in six of the courses listed below or their equivalents. The six courses must be selected from at least three of the six areas listed.

1. Active and Passive Circuits:
   EEC110A Electronic Circuits I
   EEC110B Electronic Circuits II

2. Electromagnetics:
   EEC130A Introductory Electromagnetics I
   EEC130B Introductory Electromagnetics II

3. Physical Electronics:
   EEC140A Principles of Device Physics I
   EEC140B Principles of Device Physics II

4. Signals and Systems:
   EEC150A Introduction to Signals and Systems I
   EEC150B Introduction to Signals and Systems II

5. Computer Engineering:
   ECS30 Introduction to Programming and Problem Solving
   ECS40 Introduction to Software Development
   EEC70 Computer Structure and Assembly
   EEC73 Applications of Object-Oriented Programming

6. Digital Systems:
   EEC170 Introduction to Computer Architecture
   EEC180A Digital Systems I
   EEC180B Digital Systems II

None of these courses can be counted toward an ECE graduate degree.

E. Planned Educational Leave Program (PELP)

The PELP application must be routed through the ECE Graduate Program Coordinator for the ECE Graduate Advisor's approval. University employment of graduate students on PELP is against department and university policy. In some cases, a one-time only exception can be made. ECE students may not be on PELP status any longer than three academic quarters. In the event that a PELP expires, it will be necessary to file a readmission application.

F. Filing Fee Status
In order to be approved for filing fee status, a student must submit the filing fee request along with signatures of at least two members of the PhD Dissertation Reading Committee stating that they have received an acceptable working draft of the dissertation. ECE students may not be on filing fee status any longer than two academic quarters. This application must be routed through the ECE Graduate Program Coordinator for the ECE Graduate Advisor's approval and then must be filed with Graduate Studies. In the event that filing fee status expires, it will be necessary to file a readmission application.

G. Readmission

Upon re-admission, an ECE student will be held to new program requirements.

V. DEGREE PROGRAM TIMELINE

Under the best of circumstances, the expectation is that full-time students in the PhD program will follow the following timeline:

<table>
<thead>
<tr>
<th>Task</th>
<th>Academic Quarter</th>
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<tbody>
<tr>
<td>Select a Faculty Research Advisor</td>
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<td>Complete the Ph.D. Preliminary Evaluation</td>
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<td>Select a Guidance Committee</td>
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<tr>
<td>Submit a Program of Study</td>
<td>4</td>
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<tr>
<td>Select a Qualifying Exam Committee</td>
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<tr>
<td>Submit a research proposal to the Qualifying Committee and an Application for Qualifying Examinations to the Graduate Advisor.</td>
<td>7</td>
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<tr>
<td>Select a dissertation committee</td>
<td>8</td>
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<tr>
<td>File an Application for Advancement to Candidacy</td>
<td>8</td>
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<tr>
<td>Complete the dissertation</td>
<td>12</td>
</tr>
<tr>
<td>Schedule an exit seminar</td>
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