TO: RAJEVAN AMIRTHARAJAH, Electrical and Computer Engineering Graduate Program Chair

FROM: KYAW THA PAW U, Graduate Council Chair

RE: Electrical and Computer Engineering Degree Requirements

Enclosed is a copy of the Electrical and Computer Engineering graduate degree requirements as approved by Graduate Council on June 27, 2016. These degree requirements are now the official requirements for the Electrical and Computer Engineering Graduate Program and will be posted on the Office of Graduate Studies program webpage:

https://gradstudies.ucdavis.edu/programs/geec

Please be aware and remind your graduate program advisors and Electrical and Computer Engineering graduate program members that GC recently implemented two important policies related to degree requirements. The Co-Authorship Policy (GC2015-01) allows co-authorship portions of dissertations and theses, unless a graduate group passes a specific degree policy disallowing co-authorship. Policy on Service on Advanced Degree Committees (GC1998-01 (rev. 14)) notes that faculty on dissertation and thesis committees, after asking for revisions on an original thesis or dissertation, cannot ask for further changes on any unrevised portion of a revision that they should have noted on the first reading. These policies are now listed in the Graduate Studies and Graduate Council websites. Please feel free to contact me if you have any questions regarding these policies.

Thank you for your efforts on behalf of graduate education.

Sincerely,

Kyaw Tha Paw U, Chair
Graduate Council

c: Kyaw Tha Paw U, Graduate Council Chair
John King, Graduate Studies Director of Analysis and Policy
Trina Giardino, Graduate Studies Administrative Analyst
Kyle Westbrook, Graduate Program Coordinator
B.S./M.S. Integrated Degree Program Requirements

1) Admissions requirements:
   a) During Junior Year:
      The Electrical and Computer Engineering Graduate Program offers two B.S./M.S.
      integrated degree programs, the Electrical and Computer Engineering Integrated Degree
      Program (IDP) for ECE undergraduates, and the Joint Physics-Electrical and Computer
      Engineering IDP for Physics undergraduates. Undergraduate students in ECE and Physics
      at UC Davis seeking admission to the B.S./M.S. must apply during their junior year to
      these graduate degree programs.

      Undergraduate students with junior standing, as of the Fall quarter, with a desire to
      complete a Master’s of Science in Electrical and Computer Engineering through the IDP
      program must submit an Integrated Degree Program application, which is posted on the
      ECE department website, to the Undergraduate Program Coordinator by March 31.

      Materials for IDP admission consideration include:
      • ECE B.S./M.S. Application Form
      • Students with a UC Davis cumulative GPA of 3.5 or greater must list three
        references.
      • Students with a UC Davis cumulative GPA of 3.2 – 3.5 must submit three letters
        of recommendation, preferably from members of the Academic Senate. The
        names and positions of the three letter writers must be listed on the application
        form.

      Upon admission, students will complete two graduate level courses concurrently with
      their undergraduate education. Once admitted to the IDP, participants are required to
      maintain a UC Davis cumulative GPA of 3.2 in their coursework to advance to graduate
      standing upon completion of the Bachelor’s degree.

   b) Admission Requirements to Advance to Graduate Standing:
      Students admitted to ECE’s IDP programs must submit a graduate application, by the
      stated deadline, in order to transition into graduate standing. Application deadlines are
      updated yearly, and are available on the Electrical and Computer Engineering graduate
      application webpage. Applications are submitted online through the Office of Graduate
      Studies. Additional materials required for admission consideration include:
      • Three letters of recommendation – required regardless of GPA;
      • A Statement of Purpose – which should indicate the student is applying for the
        B.S./M.S. IDP and the quarter the student expects to begin graduate study in
        addition to their intent to do research;
• a Personal History and Diversity Statement;
• Graduate Record Examination (GRE) – General Test, if applicable.

Students with a UC Davis cumulative GPA above 3.5 and at least 3 quarters in residence will have the GRE exam requirement waived. The GRE is required, as for general applicants, for those with a UC Davis cumulative GPA below 3.5 and/or less than 3 quarters in residence.

The student is awarded a Bachelor’s degree as soon as their B.S. requirements are completed. Students in the IDP program should apply to switch to graduate status in the quarter immediately following completion of their B.S. degree.

c) **Prerequisites:** None

d) **Deficiencies:** Admitted students not holding a Bachelor’s Degree in Electrical and Computer Engineering must complete a remedial course plan.

Students with a background other than electrical or computer engineering will meet with the ECE Graduate Adviser 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

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 and cannot be taken on an “S/U” basis. Remedial courses may be taken concurrently with courses used to satisfy graduate degree requirements and must be completed prior to advancing to candidacy.
2) **IDP M.S. Degree, Master’s Plan I (Thesis) and Plan II (Project/Examination):**

Students should decide, in consultation with their Major Professor, which plan best suits their individual goals. Plan I gives the student an opportunity to perform in-depth research and thesis writing, whereas Plan II provides more learning from coursework.

**IDP M.S. Plan I.** This plan requires a minimum of 30 units of graduate and upper division courses (the 100 and 200 series only), of which at least 12 units must be graduate engineering courses (200 series) in the major field. Not more than 3 units of graduate seminar and 9 research units can be used to satisfy the 30-unit requirement. In addition, a thesis is required. The thesis serves as the capstone requirement. All courses listed on the Program of Study must be passed with a “B-” or higher. A course in which a student receives a “C+” or lower cannot be used to satisfy the unit requirement for the M.S. degree but will count in determining the grade point average.

**IDP M.S. Plan II.** This plan requires a minimum of 36 units of graduate and upper division courses (the 100 and 200 series only). At least 18 units must be graduate courses (200 series), excluding seminar and research units, of which at least 15 units must be in graduate Electrical and Computer Engineering courses. Not more than 3 units of graduate seminar and 6 units of research (299 or equivalent) may be used to satisfy the 36-unit requirement. A comprehensive final examination in the major subject is required of each candidate. No thesis is required. The capstone requirement is fulfilled by a capstone written report, and oral examination, on an appropriately comprehensive topic after the student has advanced to candidacy.

<table>
<thead>
<tr>
<th>IDP M.S. Plan</th>
<th>Capstone Requirement</th>
<th>No. of graduate units required</th>
<th>No. of EEC 299 units allowed toward coursework</th>
<th>No. of Seminar units allowed toward coursework</th>
<th>Committee Constitution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan I (Thesis)</td>
<td>A written thesis</td>
<td>12</td>
<td>9</td>
<td>3</td>
<td>Three faculty members; Major Professor serves as Chair of committee</td>
</tr>
<tr>
<td>Plan II (Comprehensive Exam)</td>
<td>Written report and oral examination</td>
<td>18</td>
<td>6</td>
<td>3</td>
<td>Three faculty members; Major Professor serves as Chair of committee</td>
</tr>
</tbody>
</table>
3) **Course Requirements - (30 units)**

   a) **Core Courses** *None*

   b) **Elective Courses** *None*

   c) **Summary:**

   1. **IDP M.S. Plan I (Thesis)**

   Thirty (30) units of upper-division and graduate course work, a thesis, and a minimum of three quarters of academic residence are required.

   At least 12 of the 30 units must be ECE graduate courses (excluding 29X seminar series and 299), at most 9 units can be research (299), at most 3 units can be seminar (290-297, excluding 290C) in ECE or other approved program, and the remaining units required to total 30 units must either be upper division technical or graduate courses. A student should register for the number of 299 research and independent study units that reflects the actual effort and time devoted to thesis work, although no more than nine units can be counted.

   Courses required for the ECE undergraduate degree, or the following courses: EEC100, EEC110A/B, EEC130A/B, EEC140A/B, EEC150A/B, EEC161, EEC170, EEC172, and EEC180A/B, may not be used to satisfy the requirements of the ECE M.S. degree.

   Full-time students must enroll for 12 units per quarter including research, academic and seminar units. Courses that fulfill any of the program course requirements may not be taken S/U unless the course is normally graded S/U. Once course requirements are completed, students can take additional classes as needed, although the 12 units per quarter are generally fulfilled with a research class (299) and perhaps seminars. Per UC regulations students cannot enroll in more than 12 units of graduate level courses (200) or more than 16 units of combined undergraduate and graduate level (100, 200, 300) courses per quarter.

2. **IDP M.S. Plan II (Comprehensive Exam)**

   Thirty-six (36) units of upper-division and graduate coursework, satisfactory performance on a comprehensive final examination, and a minimum of three quarters of academic residence are required.

   At least 18 of the 36 units must be graduate engineering courses of which 15 units must be ECE graduate courses. Furthermore, at most 6 units can be research (299), at most 3 units can be seminar (290-297, excluding 290C) in ECE or other approved program, and the remaining units required to total 36 units must either be upper division technical or graduate courses. A student who elects Plan II can register for 299, research and independent study, and should do so while preparing for the Comprehensive Examination. The number of 299 units taken should reflect the amount of time and effort devoted to the preparation. However, only 6 units of 299 can be applied toward the 36-unit requirement.

   Courses required for the ECE undergraduate degree, or the following courses: EEC100, EEC110A/B, EEC130A/B, EEC140A/B, EEC150A/B, EEC161, EEC170, EEC172, and EEC180A/B, may not be used to satisfy the requirements of the ECE M.S. degree.
Full-time students must enroll for 12 units per quarter including research, academic and seminar units. Courses that fulfill any of the program course requirements may not be taken S/U unless the course is normally graded S/U. Once course requirements are completed, students can take additional classes as needed, although the 12 units per quarter are generally fulfilled with a research class (299) and perhaps seminars. Per UC regulations students cannot enroll in more than 12 units of graduate level courses (200) or more than 16 units of combined undergraduate and graduate level (100, 200, 300) courses per quarter.

A summary of coursework requirements is contained in the table below:

<table>
<thead>
<tr>
<th>Number of graduate ECE courses taken in undergraduate status</th>
<th>IDP M.S. Plan I</th>
<th>IDP M.S. Plan II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum number of graduate engineering course units (exclusive of 290, 290C and 299)</td>
<td>12 (12)</td>
<td>18 (15)</td>
</tr>
<tr>
<td>Minimum number of graduate and undergraduate course units (exclusive of 290 and 299 and courses listed below)</td>
<td>18</td>
<td>27</td>
</tr>
<tr>
<td>EEC 290 (Seminar)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>EEC 299 (One unit of EEC 290C must be included each quarter when 299 units are taken but are not listed on the Program of Study.)</td>
<td>Variable (at most 9 units)</td>
<td>Variable (at most 6 units)</td>
</tr>
<tr>
<td>TOTAL MINIMUM UNITS REQUIRED</td>
<td>30</td>
<td>36</td>
</tr>
</tbody>
</table>

4) Special requirements:
All graduate students are required to take EEC290, Seminar in Electrical and Computer Engineering, each Fall quarter. An S grade in EEC390, the Teaching of Electrical and Computer Engineering, is required to be eligible to hold a Teaching Assistantship in ECE but may not be used to satisfy graduate coursework requirements.

5) Committees:
a) IDP Admission Committee:
Completed applications submitted to the Undergraduate Program Coordinator by the application deadline will be submitted to the IDP Admission Committee for consideration. At minimum, this committee consists of ECE’s Vice Chair for Undergraduate Studies and ECE’s Vice Chair for Graduate Studies. Notification of
admission decisions will be sent prior to registration for the Fall quarter in order for admitted applicants to select which two graduate courses to take while in senior status.

b) **Graduate Admission Committee**:  
Once the completed application, all supporting materials, and the application fee have been received, the application will be submitted to the Admissions Committee. The Admissions Committee consists of the faculty members of ECE’s Graduate Study Committee (GSC) and the GSC Admissions Chair. Applicants who apply by the Space Available Deadline (but after the General Deadline) are not guaranteed to have their application reviewed by the graduate program. Their application will be reviewed only if the graduate program determines that they have additional space available. Based on a review of the entire application, a recommendation is made to accept or decline an applicant’s request for admission. The recommendation to accept or decline an applicant’s request for admission is forwarded to the Dean of Graduate Studies for final approval of admission. Notification of admissions decisions will be sent by Graduate Studies. Applications are accepted from the date the admission system opens (typically in September) through the Space Available Deadline for the next Fall-entering class.

c) **Course Guidance or Advising Committee**  
The Major Professor and the ECE Graduate Adviser will assist the student in developing a Program of Study. See the section below on “Advising and Mentoring”.

By the third quarter of enrollment the student must file a Program of Study that must be routed through the ECE Graduate Program Coordinator for the ECE Graduate Adviser's approval.

d) **Thesis Committee for IDP M.S. Plan I**  
At advancement to candidacy, the student will declare an M.S. Thesis committee. The ECE Graduate Adviser will nominate the committee based on consultations with the student and the Major Professor. This committee is chaired by the Major Professor and 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 assist in the guidance of the student and to read and approve the thesis. The thesis must be prepared in accordance with Graduate Studies guidelines.

e) **Comprehensive Examination Committee for IDP M.S. Plan II**  
At advancement to candidacy, the student will declare an M.S. Comprehensive Examination committee. The ECE Graduate Adviser will nominate the committee based on consultations with the student and the Major Professor. This committee is chaired by the Major Professor and 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 assist in the guidance of the student and to give the comprehensive exam and approve the final report.

6) **Advising Structure and Mentoring:**  
The Major Professor is the primary mentor during the student’s career at UC Davis and will assist with developing the student’s Program of Study. The Major Professor serves as the chair of the Thesis Committee (for Plan I) or Comprehensive Exam Committee (for Plan II). The student must select a Major Professor from the members of the ECE Graduate Program as soon as possible, but no later than the beginning of the third quarter of
enrollment. In the case of a change of Major Professor, signatures of the previous and new major professor are required acknowledging the change. The ECE Vice Chair for Graduate Studies, also referred to as the Graduate Program Chair, will serve as the interim adviser to new students during the process of selecting a major professor.

The Graduate Adviser, who is nominated by the Department Chair and appointed by the Dean of Graduate Studies, is a resource for information on academic requirements, policies and procedures, and registration information until a major professor is selected. The ECE Graduate Adviser is responsible for reviewing programs of study for each student and acting on student petitions.

The Graduate Program Coordinator should be the first person consulted on all actions regarding graduate affairs. The Graduate Program Coordinator may advise the student to contact the ECE Graduate Adviser or the Office of Graduate Studies to address particular issues.

ECE Mentoring Guidelines can be found in the Graduate Student Handbook, which is located on ECE’s Graduate Program webpage.

7) Advancement to Candidacy:

Every student must file an official application for Candidacy for the Degree of Master of Science and pay the Candidacy Fee after completing one-half of their course requirements and at least one quarter before completing all degree requirements; this is typically the third quarter. The Candidacy for the Degree of Master of Science form can be found online at: http://www.gradstudies.ucdavis.edu/forms/. A completed form includes a list of courses the student will take to complete degree requirements. If changes must be made to the student’s course plan after s/he has advanced to candidacy, the Graduate Adviser must recommend these changes to Graduate Studies. Students must have the ECE Graduate Adviser and committee Chair, if applicable, sign the candidacy form before it can be submitted to Graduate Studies. If the candidacy is approved, the Office of Graduate Studies will send a copy to: the appropriate Graduate Program Coordinator and the student; the Thesis Committee Chair will also receive a copy, if applicable. If the Office of Graduate Studies determines that a student is not eligible for advancement, the program and the student will be told the reasons for the application’s deferral. Some reasons for deferring an application include: grade point average below 3.0, outstanding “I” grades in required courses, or insufficient units.

8) Comprehensive Examination and/or Thesis Requirements:

a) Thesis Requirements (IDP Plan I):

The M.S. thesis must demonstrate the student's proficiency in research methods and scientific analysis, and a thorough knowledge of the state-of-the-art of the student’s chosen field. Original contributions to knowledge are encouraged, but not expected, at the M.S. degree level. Thus, an M.S. thesis may consist of:

1. An original technical or research contribution of limited scope.
2. A critical evaluation of the state-of-the-art of a current research area.
3. An advanced design project, either analytical or experimental.

Research for the Master's thesis is to be carried out under the supervision of a faculty
member of the program. The thesis research must be conducted while the student is enrolled in the program. The thesis is submitted to the thesis committee at least one month before the student plans to make requested revisions. All committee members must approve the thesis and sign the title page before the thesis is submitted to Graduate Studies for final approval. Should the committee determine that the thesis is unacceptable, even with substantial revisions, the program may recommend to the Dean of Graduate Studies that the student be disqualified from the program.

The thesis must be filed in a quarter in which the student is registered or on filing fee. Instructions on preparation of the thesis and a schedule of dates for filing the thesis in final form are available from Graduate Studies; the dates are also printed in the UC Davis General Catalog and in the Class Schedule and Registration Guide issued each quarter. A student must have a GPA of 3.0 for the M.S. degree to be awarded.

b) **Comprehensive Examination (IDP Plan II):**

Fulfillment of the Comprehensive Examination is the last requirement of the M.S. Plan II. The examination may be taken once the student has completed required courses and advanced to candidacy.

The purpose of the exam is to demonstrate the student's ability to initiate and carry to completion a short engineering investigation. The examination has two parts: an oral presentation and a written report.

The oral presentation consists of a seminar attended by the Comprehensive Examination Committee. After a formal talk on the subject of the investigation, the Committee questions the student on that subject and on related topics.

The topic of the written report is chosen by the Major Professor in consultation with the student. It can be a literature search, an in-depth study of a particular topic, or a brief experimental investigation. The report is concise and follows the style of an IEEE paper.

With the advance endorsement of the student's Major Professor and the ECE Graduate Adviser, a student in the PhD program may request permission from his or her PhD Qualifying Exam Committee to combine the comprehensive exam for the M.S. Plan II degree with the PhD qualifying exam. The PhD Qualifying Exam Committee will only approve such requests provided that the M.S. requirements are met as a subset of a successful PhD Qualifying Examination as determined by the PhD Qualifying Exam Committee. With the permission of the PhD Qualifying Exam Committee, a student may submit a version of the PhD research proposal in fulfillment of the M.S. Plan II written report requirement. The M.S. Plan II report must be considered separately from the student's PhD research proposal; however, the PhD research proposal may contain text from the M.S. written report.

The Exam committee’s unanimous vote is required to pass a student on the exam. If a student does not pass the exam, the committee may recommend that the student be reexamined a second time, but only if the Graduate Adviser concurs with the committee. The second exam must take place within one quarter of the first exam. The format of the second exam is the same as that of the first exam and may include the submission of an amended version of the report. The examination may not be repeated.
more than once. A student who does not pass on the second attempt will be recommended for disqualification from further graduate work in the program to the Dean of Graduate Studies.

After passing the examination a copy of the M.S. Plan II report must be submitted to the ECE Graduate Program Coordinator. The Master’s Report Form is signed by the Program Graduate Adviser and then forwarded to the Office of Graduate Studies. The deadlines for completing this requirement are listed each quarter in the campus General Catalog (available online at the website of the Office of the Registrar). A candidate must be a registered student or in Filing Fee status at the time the program submits the form, with the exception of the summer period between the end of the Spring Quarter and the beginning of Fall Quarter. The program must file the report with Graduate Studies within one week of the end of the quarter in which the student’s degree will be conferred.

9) **Normative Time to Degree:**

Careful adherence to the program guidelines presented above make it possible for a student to complete all degree requirements in three quarters of graduate study. Some students may take additional time to complete the master’s degree.

10) **Typical Time Line and Sequence of Events:**

In order to make satisfactory progress, the expectation is that full-time students in the M.S. program will follow the timeline below. The number in each column is the consecutive quarter of graduate enrollment. Students not holding an ECE degree may require additional quarters of study to complete their M.S. degree requirements depending on the number of remedial courses needed.

<table>
<thead>
<tr>
<th>IDP M.S. Plan I</th>
<th>IDP M.S. Plan II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Major Professor</td>
<td>1</td>
</tr>
<tr>
<td>Application for candidacy which includes a plan of study</td>
<td>2</td>
</tr>
<tr>
<td>Application Form for Master of Science Plan I Thesis Committee</td>
<td>2</td>
</tr>
<tr>
<td>Application Form for Master of Science Plan II Comprehensive</td>
<td>NA</td>
</tr>
<tr>
<td>Examination</td>
<td>Plan I Thesis</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td>3 - 6</td>
</tr>
</tbody>
</table>

*The timeline for students entering the ECE graduate program without a BS in Electrical and Computer Engineering and who must complete remedial courses will likely be extended by 1-2 quarters, depending on the extent to which their previous coursework fulfills the prerequisite requirements.

11) **Sources of funding**
Sources of funding in the ECE Graduate Program include: ECE Graduate Program fellowships, Graduate Student Researcher appointments and Teaching Assistantships. Funding decisions related to fellowships are generally made by the graduate program or Graduate Studies, depending on the source of funding for the fellowship. Not all fellowship funding decisions are made by either the graduate program or Graduate Studies; as examples, graduate students often seek fellowship funding directly from the National Science Foundation, National Institutes of Health, foundations, and a range of other agencies and organizations. Funding decisions related to Graduate Student Researchers are made by the Principal Investigator of the source of funding. Teaching Assistant appointment decisions are made by the Undergraduate Program Chair approximately four weeks prior to the start of each quarter and are based, in part, on a graduate student’s educational background, grade point average, academic standing, degree objective, feedback from instructors, and recruitment status at the time of entering the graduate program.
Master’s students in Electrical and Computer Engineering at UC Davis are typically self-funded or apply for graduate financial aid, such as student loans. U.S. Citizens and Permanent Residents must file a FAFSA annually in order to be eligible for graduate financial aid. Master’s students are welcome to apply for fellowships, Teaching Assistant and Graduate Student Researcher appointments.

12) **PELP, In Absentia and Filing Fee status.**
Information about PELP (Planned Educational Leave), In Absentia (reduced fees when researching out of state), and Filing Fee status can be found in the Graduate Student Guide: [http://www.gradstudies.ucdavis.edu/publications/](http://www.gradstudies.ucdavis.edu/publications/)

M.S. students are eligible for filing fee status after completing their coursework (Program of Study) and a working draft of their thesis or comprehensive examination report. In order to be approved for filing fee status, a student must submit the filing fee request along with signatures of all three members of the Thesis Committee or Comprehensive Examination Committee stating they have received an acceptable working draft of the thesis or comprehensive examination report. This application must be routed through the ECE Graduate Program Coordinator for the ECE Graduate Adviser’s approval and then must be filed with Graduate Studies. Filing Fee is available for one quarter only, but extensions may be approved on a case-by-case basis. In the event that filing fee status expires, the student must file a readmission application.
Master’s Degree Requirements

1) Admissions requirements:
Consideration for admission requires completion of Graduate Studies’ online application, with fee payment, by the stated deadline. Application deadlines are updated yearly, and are available on the Electrical and Computer Engineering graduate application webpage. Applications are submitted online through the Office of Graduate Studies. Additional materials required for admission consideration include:

- A bachelor’s degree from an accredited institution. International applicants must meet an equivalent minimal level of study;
- Transcripts from each college-level institution attended;
- Three letters of recommendation;
- A Statement of Purpose, and a Personal History and Diversity Statement;
- Graduate Record Examination (GRE) – General Test;
- TOEFL or IELTS score (if applicable); International applicants must meet the Office of Graduate Studies minimum score requirement. Applicants who believe they may be eligible for a TOEFL or IELTS waiver should consult the Office of Graduate Studies page for international applicants for eligibility requirements.

Meeting some or all of the minimum criteria does not guarantee admission, but merely eligibility. Admission decisions are made on a case-by-case basis, with emphasis placed on the promise of success in graduate studies and research, as judged by the students’ previous research experience, college record, statement of purpose and letters of recommendation. The decision to recommend admission to the Dean of Graduate Studies will be made by the Electrical and Computer Engineering Graduate Program Admissions Committee on the basis of available space and the competitiveness of the eligible applicant pool.

Applicants to the master’s program are welcome to communicate with potential research advisers (major professors) prior to admission to the program. However, it is not a requirement for admissions consideration.

a) **Prerequisites:** None

b) **Deficiencies:** Admitted students not holding a Bachelor’s Degree in Electrical and Computer Engineering must complete a remedial course plan.

Students with a background other than electrical or computer engineering will meet with the ECE Graduate Adviser 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

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 and cannot be
taken on an “S/U” basis. Remedial courses may be taken concurrently with courses
used to satisfy graduate degree requirements and must be completed prior to
advancing to candidacy.

2) M.S. Degree, Master’s Plan I (Thesis) and Plan II (Project/Examination):

Students should note that ECE program requirements are more stringent than those stated
by Graduate Studies. The ECE program requirements, therefore, take precedence.
Students should decide, in consultation with their Major Professor, which plan best suits
their individual goals. Plan I gives the student an opportunity to perform in-depth research
and thesis writing, whereas Plan II provides more learning from coursework.

Plan I. This plan requires a minimum of 36 units of graduate and upper division courses
(the 100 and 200 series only), of which at least 15 units must be graduate engineering
courses (200 series) with 12 out of the 15 units of graduate work in the major field
excluding seminar and research units. Not more than 3 units of graduate seminar and 9
research units may be used to satisfy the 36-unit requirement. In addition, a thesis is
required. The thesis serves as the capstone requirement. All courses listed on the Program
of Study must be passed with a “B-“ or higher. A course in which a student receives a “C+”
or lower cannot be used to satisfy the unit requirement for the M.S. degree but will count in
determining the grade point average.

This Plan requires more units than the UC Davis minimum, which are:
30 units of graduate and upper division courses (the 100 and 200 series only), at least 12 of
which must be graduate work in the major field.

Plan II. This plan requires a minimum of 36 units of graduate and upper division courses
(the 100 and 200 series only). At least 24 units must be graduate courses (200 series),
excluding seminar and research units, with a minimum of 18 units in graduate engineering
courses of which at least 15 units must be in graduate Electrical and Computer Engineering
courses. Not more than 1 unit of graduate seminar and 3 units of research (299 or equivalent) may be used to satisfy the 36-unit requirement. A comprehensive final examination in the major subject is required of each candidate. No thesis is required. The capstone requirement is fulfilled by a capstone written report, and oral examination, on an appropriately comprehensive topic at the end of year 2.

<table>
<thead>
<tr>
<th>M.S. Plan</th>
<th>Capstone Requirement</th>
<th>No. of graduate units required</th>
<th>No. of EEC 299 units allowed toward coursework</th>
<th>No. of Seminar units allowed toward coursework</th>
<th>Committee Constitution</th>
</tr>
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<tbody>
<tr>
<td>Plan I (Thesis)</td>
<td>A written thesis</td>
<td>15</td>
<td>9</td>
<td>3</td>
<td>Three faculty members; Major Professor serves as Chair of committee</td>
</tr>
<tr>
<td>Plan II (Comprehensive Exam)</td>
<td>Written report and oral examination</td>
<td>24</td>
<td>3</td>
<td>1</td>
<td>Three faculty members; Major Professor serves as Chair of committee</td>
</tr>
</tbody>
</table>

3) **Course Requirements - (36 units)**

a) **Core Courses** *None*

b) **Elective Courses** *None*

c) **Summary:**

1. **M.S. Plan I (Thesis)**

Thirty-six (36) units of upper-division and graduate course work, a thesis, and a minimum of three quarters of academic residence are required.

At least 15 units must be in graduate engineering courses (excluding 29X seminar series and 299) and of these 15 units, at least 12 units must be in graduate Electrical and Computer Engineering courses (again excluding 29X seminar series and 299). The balance of the 36-unit requirement may be met with a combination of upper division technical elective courses and 29X and 299 in ECE or other approved programs. No more than three seminar (290-297, excluding 290C) units can be counted. A student should register for the number of 299 research and independent study units that reflects the actual effort and time devoted to thesis work, although no more than nine units can be counted.

Courses required for the ECE undergraduate degree, or the following courses: EEC100, EEC110A/B, EEC130A/B, EEC140A/B, EEC150A/B, EEC161, EEC170,
EEC172, and EEC180A/B, may not be used to satisfy the requirements of the ECE M.S. degree.

Full-time students must enroll for 12 units per quarter including research, academic and seminar units. Courses that fulfill any of the program course requirements may not be taken S/U unless the course is normally graded S/U. Once course requirements are completed, students can take additional classes as needed, although the 12 units per quarter are generally fulfilled with a research class (299) and perhaps seminars. Per UC regulations students cannot enroll in more than 12 units of graduate level courses (200) or more than 16 units of combined undergraduate and graduate level (100, 200, 300) courses per quarter.

2. M.S. Plan II (Comprehensive Exam)

Thirty-six (36) units of upper-division and graduate coursework, satisfactory performance on a comprehensive final examination, and a minimum of three quarters of academic residence are required.

At least 24 units must be in 200 series courses (excluding 29X seminar series and 299) with a minimum of 18 units in graduate engineering courses of which at least 15 units must be in graduate Electrical and Computer Engineering courses. A student who elects Plan II can register for 299, research and independent study, and should do so while preparing for the Comprehensive Examination. The number of 299 units taken should reflect the amount of time and effort devoted to the preparation. However, only three units of 299 and one unit of seminar (290-297, excluding 290C) in ECE or other approved programs can be applied toward the 36-unit requirement. These 299 and 29X units may not be applied toward the 24-unit graduate course requirement.

Courses required for the ECE undergraduate degree, or the following courses: EEC100, EEC110A/B, EEC130A/B, EEC140A/B, EEC150A/B, EEC161, EEC170, EEC172, and EEC180A/B, may not be used to satisfy the requirements of the ECE M.S. degree.

A summary of coursework requirements is contained in the table below:

<table>
<thead>
<tr>
<th>Minimum number of graduate engineering course units (exclusive of 290, 290C and 299) (Number of graduate engineering course units that must be ECE course units)</th>
<th>Plan I M.S.</th>
<th>Plan II M.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 (12)</td>
<td>18 (15)</td>
<td></td>
</tr>
</tbody>
</table>
Minimum number of graduate and undergraduate course units (exclusive of 290 and 299 and courses listed below) | 24 | 32
---|---|---
EEC 290 (Seminar) | 3 | 1
EEC 299 (One unit of EEC 290C must be included each quarter when 299 units are taken but are not listed on the Program of Study.) | Variable (at most 9 units) | Variable (at most 3 units)
TOTAL MINIMUM UNITS REQUIRED | 36 | 36

4) **Special requirements:**
All graduate students are required to take EEC290, Seminar in Electrical and Computer Engineering, each Fall quarter. An S grade in EEC390, the Teaching of Electrical and Computer Engineering, is required to be eligible to hold a Teaching Assistantship in ECE but may not be used to satisfy graduate coursework requirements. International students may need to take LIN25, LIN26 LIN391, or a combination thereof, to meet university language proficiency requirements.

5) **Committees:**
   a) **Admission Committee:**
   Once the completed application, all supporting materials, and the application fee have been received, the application will be submitted to the Admissions Committee. The Admissions Committee consists of the faculty members of ECE’s Graduate Study Committee (GSC) and the GSC Admissions Chair. Applicants who apply by the Space Available Deadline (but after the General Deadline) are not guaranteed to have their application reviewed by the graduate program. Their application will be reviewed only if the graduate program determines that they have additional space available. Based on a review of the entire application, a recommendation is made to accept or decline an applicant’s request for admission. The recommendation to accept or decline an applicant’s request for admission is forwarded to the Dean of Graduate Studies for final approval of admission. Notification of admissions decisions will be sent by Graduate Studies. Applications are accepted from the date the admission system opens (typically in September) through the Space Available Deadline for the next Fall-entering class.

   b) **Course Guidance or Advising Committee**
   The Major Professor and the ECE Graduate Adviser will assist the student in developing a Program of Study. See the section below on “Advising and Mentoring”.
   By the third quarter of enrollment the student must file a Program of Study that must be routed through the ECE Graduate Program Coordinator for the ECE Graduate Adviser's approval.

   c) **Thesis Committee for M.S. Plan I**
At advancement to candidacy, the student will declare an M.S. Thesis committee. The ECE Graduate Adviser will nominate the committee based on consultations with the student and the Major Professor. This committee is chaired by the Major Professor and 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 assist in the guidance of the student and to read and approve the thesis. The thesis must be prepared in accordance with Graduate Studies guidelines.

d) **Comprehensive Examination Committee for M.S. Plan II**
At advancement to candidacy, the student will declare an M.S. Comprehensive Examination committee. The ECE Graduate Adviser will nominate the committee based on consultations with the student and the Major Professor. This committee is chaired by the Major Professor and 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 assist in the guidance of the student and to give the comprehensive exam and approve the final report.

6) **Advising Structure and Mentoring:**
The **Major Professor** is the primary mentor during the student’s career at UC Davis and will assist with developing the student’s Program of Study. The Major Professor serves as the chair of the Thesis Committee (for Plan I) or Comprehensive Exam Committee (for Plan II). The student must select a Major Professor from the members of the ECE Graduate Program as soon as possible, but no later than the beginning of the third quarter of enrollment. In the case of a change of Major Professor, signatures of the previous and new major professor are required acknowledging the change. The ECE Vice Chair for Graduate Studies, also referred to as the Graduate Program Chair, will serve as the interim adviser to new students during the process of selecting a major professor.

The **Graduate Adviser**, who is nominated by the Department Chair and appointed by the Dean of Graduate Studies, is a resource for information on academic requirements, policies and procedures, and registration information until a major professor is selected. The ECE Graduate Adviser is responsible for reviewing programs of study for each student and acting on student petitions.

The **Graduate Program Coordinator** should be the first person consulted on all actions regarding graduate affairs. The Graduate Program Coordinator may advise the student to contact the ECE Graduate Adviser or the Office of Graduate Studies to address particular issues.

ECE Mentoring Guidelines can be found in the Graduate Student Handbook which is located on ECE’s Graduate Program webpage.

7) **Advancement to Candidacy:**
Every student must file an official application for Candidacy for the Degree of Master of Science and pay the Candidacy Fee after completing one-half of their course requirements and at least one quarter before completing all degree requirements; this is typically the third quarter. The Candidacy for the Degree of Master of Science form can be found online at: [http://www.gradstudies.ucdavis.edu/forms/](http://www.gradstudies.ucdavis.edu/forms/). A completed form includes a list of courses the student will take to complete degree requirements. If changes must be made to the student’s course plan after s/he has advanced to candidacy, the Graduate Adviser must
recommend these changes to Graduate Studies. Students must have the ECE Graduate Adviser and committee Chair, if applicable, sign the candidacy form before it can be submitted to Graduate Studies. If the candidacy is approved, the Office of Graduate Studies will send a copy to: the appropriate Graduate Program Coordinator and the student; the Thesis Committee Chair will also receive a copy, if applicable. If the Office of Graduate Studies determines that a student is not eligible for advancement, the program and the student will be told the reasons for the application’s deferral. Some reasons for deferring an application include: grade point average below 3.0, outstanding “I” grades in required courses, or insufficient units.

8) Comprehensive Examination and/or Thesis Requirements:

a) Thesis Requirements (Plan I):

The M.S. thesis must demonstrate the student's proficiency in research methods and scientific analysis, and a thorough knowledge of the state-of-the-art of the student’s chosen field. Original contributions to knowledge are encouraged, but not expected, at the M.S. degree level. Thus, an M.S. thesis may consist of:

4. An original technical or research contribution of limited scope.

5. A critical evaluation of the state-of-the-art of a current research area.

6. An advanced design project, either analytical or experimental.

Research for the Master's thesis is to be carried out under the supervision of a faculty member of the program. The thesis research must be conducted while the student is enrolled in the program. The thesis is submitted to the thesis committee at least one month before the student plans to make requested revisions. All committee members must approve the thesis and sign the title page before the thesis is submitted to Graduate Studies for final approval. Should the committee determine that the thesis is unacceptable, even with substantial revisions, the program may recommend to the Dean of Graduate Studies that the student be disqualified from the program.

The thesis must be filed in a quarter in which the student is registered or on filing fee. Instructions on preparation of the thesis and a schedule of dates for filing the thesis in final form are available from Graduate Studies; the dates are also printed in the UC Davis General Catalog and in the Class Schedule and Registration Guide issued each quarter. A student must have a GPA of 3.0 for the M.S. degree to be awarded.

b) Comprehensive Examination (Plan II):

Fulfillment of the Comprehensive Examination is the last requirement of the M.S. Plan II. The examination may be taken once the student has completed required courses and advanced to candidacy.

The purpose of the exam is to demonstrate the student's ability to initiate and carry to completion a short engineering investigation. The examination has two parts: an oral presentation and a written report.

The oral presentation consists of a seminar attended by the Comprehensive Examination Committee. After a formal talk on the subject of the investigation, the Committee questions the student on that subject and on related topics.
The topic of the written report is chosen by the Major Professor in consultation with the student. It can be a literature search, an in-depth study of a particular topic, or a brief experimental investigation. The report is concise and follows the style of an IEEE paper.

With the advance endorsement of the student's Major Professor and the ECE Graduate Adviser, a student in the PhD program may request permission from his or her PhD Qualifying Exam Committee to combine the comprehensive exam for the M.S. Plan II degree with the PhD qualifying exam. The PhD Qualifying Exam Committee will only approve such requests provided that the M.S. requirements are met as a subset of a successful PhD Qualifying Examination as determined by the PhD Qualifying Exam Committee. With the permission of the PhD Qualifying Exam Committee, a student may submit a version of the PhD research proposal in fulfillment of the M.S. Plan II written report requirement. The M.S. Plan II report must be considered separately from the student's PhD research proposal; however, the PhD research proposal may contain text from the M.S. written report.

The Exam committee’s unanimous vote is required to pass a student on the exam. If a student does not pass the exam, the committee may recommend that the student be reexamined a second time, but only if the Graduate Adviser concurs with the committee. The second exam must take place within one quarter of the first exam. The format of the second exam is the same as that of the first exam and may include the submission of an amended version of the report. The examination may not be repeated more than once. A student who does not pass on the second attempt will be recommended for disqualification from further graduate work in the program to the Dean of Graduate Studies.

After passing the examination a copy of the M.S. Plan II report must be submitted to the ECE Graduate Program Coordinator. The Master’s Report Form is signed by the Program Graduate Adviser and then forwarded to the Office of Graduate Studies. The deadlines for completing this requirement are listed each quarter in the campus General Catalog (available online at the website of the Office of the Registrar). A candidate must be a registered student or in Filing Fee status at the time the program submits the form, with the exception of the summer period between the end of the Spring Quarter and the beginning of Fall Quarter. The program must file the report with Graduate Studies within one week of the end of the quarter in which the student’s degree will be conferred.

9) **Normative Time to Degree:**

Although work for the Master of Science degree can be completed in three quarters of full-time study, generally at least 12 months of full-time study are required to complete the M.S. Plan II and 18-24 months of full-time study are required to complete the M.S. Plan I.

10) **Typical Time Line and Sequence of Events:**

In order to make satisfactory progress, the expectation is that full-time students in the M.S. program will follow the timeline below. The number in each column is the consecutive quarter of enrollment. Students not holding an ECE degree may require additional quarters
of study to complete their M.S. degree requirements depending on the number of remedial courses needed.

<table>
<thead>
<tr>
<th></th>
<th>M.S. Plan I</th>
<th>M.S. Plan II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select Major Professor</td>
<td>1 – 3</td>
<td>1 – 3</td>
</tr>
<tr>
<td>Application for candidacy which</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>includes a plan of study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application Form for Master of</td>
<td>3</td>
<td>NA</td>
</tr>
<tr>
<td>Science Plan I Thesis Committee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application Form for Master of</td>
<td>NA</td>
<td>3</td>
</tr>
<tr>
<td>Science Plan II Comprehensive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plan I Thesis</td>
<td>6</td>
<td>NA</td>
</tr>
<tr>
<td>Plan II Comprehensive Examination</td>
<td>NA</td>
<td>5</td>
</tr>
</tbody>
</table>

*The timeline for students entering the ECE graduate program without a BS in Electrical and Computer Engineering and who must complete remedial courses will likely be extended by 1-2 quarters, depending on the extent to which their previous coursework fulfills the prerequisite requirements.

11) Sources of funding
Sources of funding in the ECE Graduate Program include: ECE Graduate Program fellowships, Graduate Student Researcher appointments and Teaching Assistantships. Funding decisions related to fellowships are generally made by the graduate program or Graduate Studies, depending on the source of funding for the fellowship. Not all fellowship funding decisions are made by either the graduate program or Graduate Studies; as examples, graduate students often seek fellowship funding directly from the National Science Foundation, National Institutes of Health, foundations, and a range of other agencies and organizations. Funding decisions related to Graduate Student Researchers are made by the Principal Investigator of the source of funding. Teaching Assistant appointment decisions are made by the Undergraduate Program Chair approximately four weeks prior to the start of each quarter and are based, in part, on a graduate student’s educational background, grade point average, academic standing, degree objective, feedback from instructors, and recruitment status at the time of entering the graduate program.
Master’s students in Electrical and Computer Engineering at UC Davis are typically self-funded or apply for graduate financial aid, such as student loans. U.S. Citizens and Permanent Residents must file a FAFSA annually in order to be eligible for graduate financial aid. Master’s students are welcome to apply for fellowships, Teaching Assistant and Graduate Student Researcher appointments.

12) PELP, In Absentia and Filing Fee status.

Information about PELP (Planned Educational Leave), In Absentia (reduced fees when researching out of state), and Filing Fee status can be found in the Graduate Student Guide: http://www.gradstudies.ucdavis.edu/publications/

M.S. students are eligible for filing fee status after completing their coursework (Program of Study) and a working draft of their thesis or comprehensive examination report. In order to be approved for filing fee status, a student must submit the filing fee request along with signatures of all three members of the Thesis Committee or Comprehensive Examination Committee stating they have received an acceptable working draft of the thesis or comprehensive examination report. This application must be routed through the ECE Graduate Program Coordinator for the ECE Graduate Adviser’s approval and then must be filed with Graduate Studies. Filing Fee is available for one quarter only, but extensions may be approved on a case-by-case basis. In the event that filing fee status expires, the student must file a readmission application.

Ph.D. DEGREE REQUIREMENTS

1) Admissions Requirements:

Consideration for admission requires completion of Graduate Studies’ online application, with fee payment, by the stated deadline. Application deadlines are updated yearly, and are available on the Electrical and Computer Engineering graduate application webpage. Applications are submitted online through the Office of Graduate Studies. Additional materials required for admission consideration include:

- A bachelor’s degree from an accredited institution. International applicants must meet an equivalent minimal level of study;
- Transcripts from each college-level institution attended;
- Three letters of recommendation;
- A Statement of Purpose, and a Personal History and Diversity Statement;
- Graduate Record Examination (GRE) – General Test;
- TOEFL or IELTS score (if applicable); International applicants must meet the Office of Graduate Studies minimum score requirement. Applicants who believe they may be eligible for a TOEFL or IELTS waiver should consult the Office of Graduate Studies page for international applicants for eligibility requirements.

Meeting some or all of the minimum criteria does not guarantee admission, but merely eligibility. Admission decisions are made on a case-by-case basis, with emphasis placed on the promise of success in graduate studies and research, as judged by the students’ previous research experience, college record, statement of purpose and letters of recommendation. The decision to recommend admission to the Dean of Graduate Studies
will be made by the Electrical and Computer Engineering Graduate Program Admissions Committee on the basis of available space and the competitiveness of the eligible applicant pool.

Applicants to the Ph.D. program are strongly encouraged to communicate with potential research advisers (major professors) prior to admission to the program. It is important that the prospective students contact faculty in the ECE Graduate Program (ECEGP) whose laboratories are conducting research in areas the student wishes to pursue, in order to introduce themselves and inquire about faculty willingness to accept a new student in this degree program. This process of communicating with potential major professors should begin in the fall, prior to the relevant application deadline. Applicants should take the initiative to inquire about future research directions of laboratories, exchange research ideas with potential major professors, and make every effort to identify viable research opportunities. While formal acceptance to a research group cannot occur prior to admission, it is strongly recommended that contacts should be far-enough developed such that a tentative identification of a research adviser is made concurrently with an offer of admission.

a) **Prerequisites:** None

b) **Deficiencies:** Admitted students not holding a Bachelor’s Degree in Electrical and Computer Engineering must complete a remedial course plan.

Students with a background other than electrical or computer engineering will meet with the ECE Graduate Adviser 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

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 and cannot be taken on an “S/U” basis. Remedial courses may be taken concurrently with courses used to satisfy graduate degree requirements and must be completed prior to advancing to candidacy.

2) **Dissertation Plan: B**

   **Plan B.** Specifies a three member (minimum) dissertation committee, an optional final oral examination (made on an individual student basis by the dissertation committee), and a required exit seminar.

3) **Course Requirements – (45 units minimum)**

   a) **Core Courses:** None
   
   b) **Elective Courses** None
   
   c) **Summary:**

   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.

   In-depth knowledge is demonstrated by the completion of at least 30 units, of which 21 must be from graduate level courses (200-289), in one specialty area, the major.

   The requirement of breadth is demonstrated 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 be from a coherent set that complements the major. Examples of appropriate minors are: a subfield within the ECE program, computer science, mathematics, statistics, and physics.

   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. The doctoral program of study does not include research and seminar units but may include courses taken in a master’s program. Coursework used to fulfill degree requirements may not be taken S/U unless the course is normally graded S/U. For courses listed on the program of study, a grade point average of at least 3.5 is required. Only courses in the 100 and 200 series in which the student receives grades of “A”, “B” or “S” (290X 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 sued to satisfy the unit requirement for the Ph.D. degree but will count in determining the grade point average.

   Courses required for the ECE undergraduate degree or any of the following courses: EEC100, EEC 110A/B, EEC130A/B, EEC140A/B, EEC150A/B, EEC161, EEC170, EEC172, and EEC180A/B, may not be used to satisfy the requirements of an ECE graduate degree.

   A Doctoral Program of Study must be approved by the Major Professor, the Ph.D. Guidance Committee, the ECE graduate adviser, 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 the
Doctoral Preliminary Examination. A revised Program of Study must be submitted, and approved, each time changes are made to the coursework plan.

Students must enroll in a minimum of 12 units per quarter including research, academic and seminar units. Once course requirements are completed, students can take additional classes as needed, although the 12 units per quarter are generally fulfilled with research units (290C and 299). Per UC regulations students cannot enroll in more than 12 units of graduate level courses (200) or more than 16 units of combined undergraduate and graduate level (100, 200, 300) courses per quarter.

4) **Special Requirements:**

All graduate students are required to take EEC290, Seminar in Electrical and Computer Engineering, each Fall quarter. An S grade in EEC390, the Teaching of Electrical and Computer Engineering, is required to be eligible to hold a Teaching Assistantship in ECE but may not be used to satisfy graduate coursework requirements. International students may need to take LIN25, LIN26 LIN391, or a combination thereof, to meet university language proficiency requirements.

ECE requires an exit seminar. This seminar is administered by at least three faculty, who are members of the Dissertation Reading Committee or were members of the Qualifying Examination Committee for the student, and must be completed before the dissertation can be filed.

5) **Committees:**

a) **Admissions Committee**

Once the completed application, all supporting materials, and the application fee have been received, the application will be submitted to the Admissions Committee. The Admissions Committee consists of the faculty members of ECE’s Graduate Study Committee (GSC) and the GSC Admissions Chair. Applicants who apply by the Space Available Deadline (but after the General Deadline) are not guaranteed to have their application reviewed by the graduate program. Their application will be reviewed only if the graduate program determines that they have additional space available. Based on a review of the entire application, a recommendation is made to accept or decline an applicant’s request for admission. The recommendation to accept or decline an applicant’s request for admission is forwarded to the Dean of Graduate Studies for final approval of admission. Notification of admissions decisions will be sent by Graduate Studies. Applications are accepted from the date the admission system opens (typically in September) through the Space Available Deadline for the next fall-entering class.

b) **Major Professor Selection**

The student must select a major professor from the members of the ECE Graduate Program (ECEGP) by the end of the first 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. ECE’s Vice Chair for Graduate Studies, also referred to as the Graduate Program Chair, will serve as the interim advisor to the new students during the process of selecting a major professor.

c) **Preliminary Examination Committee**
Examination panels will be composed of 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 system design.

d) **Course Guidance Committee**

The student must declare a Ph.D. Guidance Committee after passing the Preliminary Examination. 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 ECEGP. The responsibility of this committee is to guide the student through his/her program of study until the Ph.D. Qualifying Exam is taken.

e) **Qualifying Examination Committee**

The Qualifying Examination (QE) Committee consists of five faculty members including the major professor and at least one member 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 of the ECE Graduate Program. The chair must be someone other than the student’s major professor. In consultation with his/her major professor and Graduate Adviser, the student nominates five faculty members to serve on the Qualifying Examination Committee. These nominations are submitted to the Office of Graduate Studies for formal appointment in accordance with Graduate Council policy. The QE Committee conducts the exam and submits results to the Office of Graduate Studies.

**Dissertation Reading Committee**

The Dissertation Reading Committee is a three-member committee identified by the student, in consultation with the Major Professor. The 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 third member can be either a member of the ECE Graduate Program or the Academic Senate. If the third member of the committee is neither a member of the ECE Graduate Program nor the Academic Senate, a request for an external committee membership must be completed and approved by the Graduate Adviser. If the student wishes to include two members outside the ECE Graduate Program on their committee, a four-person committee may be established. The composition of the dissertation committee is entered on the Advancement to Candidacy form and submitted to Graduate Studies for formal appointment in accordance with Graduate Council policy.

The role of the Dissertation Reading Committee is to advise the doctoral student of the research topic and methods, then to review the final completed dissertation for acceptance. The Dissertation Reading Committee Chairperson should ascertain the level of interest from other committee members regarding their direct participation in the research and dissertation review at the time the committee is constituted. Students are expected to meet with the Chair of their dissertation committee regularly. The dissertation must be reviewed and approved (via signature) by all members of this committee. Dissertation committee members are expected to read and comment on a dissertation within four weeks from its submission. This time limit policy does not apply to summer periods for faculty holding nine-month appointments. The student and faculty will coordinate a timeline for the student to present the thesis to the dissertation committee. This timeline must allow all dissertation committee members enough time to fulfill their responsibilities within the four-week deadline.
6) Advising Structure and Mentoring:

The **Major Professor** is the faculty member who assists the student in preparing a detailed program of study and who supervises the student’s research and dissertation. The Major Professor serves as the Chair of the Ph.D. Guidance Committee and Dissertation Committee. The Major Professor also serves as a member of the Qualifying Exam Committee.

The **Graduate Adviser**, who is nominated by the Department Chair and appointed by the Dean of Graduate Studies, is a resource for information on academic requirements, policies and procedures, and registration information until the Ph.D. Guidance Committee is formed.

The **Graduate Program Coordinator** should be the first person consulted on all actions regarding graduate affairs. The Graduate Program Coordinator may advise the student to contact the ECE Graduate Adviser or the Office of Graduate Studies to address particular issues.

ECE Mentoring Guidelines can be found in the Graduate Student Handbook, which is located on ECE’s Graduate Program webpage.

7) Advancement to Candidacy:

Before advancing to candidacy for a doctoral degree, a student must have satisfied all requirements set by the graduate program, must have maintained a minimum GPA of 3.5 in all coursework listed on the program of study, and must have passed both the Preliminary and Qualifying Examinations. Normally, students advance to candidacy by the end of their 9th quarter. The student must file the appropriate paperwork with the Office of Graduate Studies and pay the Candidacy Fee in order to be officially promoted to Ph.D. Candidacy. Refer to the Graduate Council website for additional details regarding the Doctoral Qualifying Examination at [http://gradstudies.ucdavis.edu/gradcouncil/policiesall.html](http://gradstudies.ucdavis.edu/gradcouncil/policiesall.html).

8) Preliminary Examination, Qualifying Examination and Dissertation Requirements:

a) Preliminary Examination

1. General Information

   The purpose of the Ph.D. preliminary examination process is to determine a student’s potential for independent research. All students are encouraged to take the preliminary examination as soon as possible after entry into the graduate program. Students admitted to the Ph.D. program who already have an M.S. degree in ECE must pass the preliminary examination within two years of admission. Students not in possession of an M.S. degree in ECE when admitted must pass the examination within their first three years. To participate in the Ph.D. preliminary examination process, a student must be in good academic standing, have full-time status, and have a major professor who signs a statement indicating his/her willingness to supervise the student provided that the student secures a “clear pass” in the examination process. A student may not participate in the examination more than twice.

   The Ph.D. preliminary examination process is based on an oral examination and a letter of support from a major professor if the result of the oral examination is
intermediate. Each preliminary examination period takes place during the winter quarter.

2. Oral Examination

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 system design. Students are required to take the examination in at least two and no more than three areas. Scores of two areas leading to the best outcome will be used. One of these two areas should be a research area of their major professor. The faculty examiners will restrict themselves to questions on the topics described in the document “Preliminary Examination Topics” which will be available each year 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 examining panel can decide the length of its exam but it must be between 15 and 30 minutes long. The oral exams will be finished by the end of the third week of the winter quarter.

3. Scoring

Each of the two examiners present will assign a score from 1 to 4, with fractional scores allowed. Generally, ‘1’ means a clear fail, ‘2’ means a marginal fail, ‘3’ means a marginal pass, and ‘4’ means a clear pass. A total score of 16 is possible and the maximum exam score of each area, which is the sum of two individual scores, is 8. The following determinations are made from scores of four examiners in two areas:

1. Clear Pass if all of the following holds: the sum of all four scores is at least 12, the exam score of each area is at least 5, and no individual score (from any of the four examiners) is less than two.
2. Intermediate result if the student does not get a clear pass but the exam score of each area is at least 4.
3. Clear Fail if the student does not achieve either a clear pass or an intermediate result.

4. Letter from Major Professor for Intermediate Result Cases

A student who secures a ”clear pass” has no other requirements and is allowed to proceed with his/her Ph.D. program. However, for a student in the intermediate range, a letter of support from the Major Professor is needed. It is understood that in order for a student to pass, the letter will have to be stronger if the student did poorly on the oral examination. The student should discuss what information his/her major professor will require him/her to provide in order to write the letter. The letter should not be more than two pages long and should be received by the Graduate Program Coordinator by the end of the sixth week of the winter quarter.

5. Outcome of the Exam for Intermediate Result Cases

The Ph.D. Preliminary Examination Committee will make a recommendation on each intermediate result case by the end of the eighth week of the winter quarter. The ECE Graduate Program faculty vote will determine the final outcome, either pass or fail, by the end of the winter quarter.

b) Qualifying Examination
1. **General Information**  
The purpose of the Doctoral Qualifying Examination (QE) 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 Preliminary Examination. 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 the ECE Graduate Adviser who will confirm that all the Ph.D. courses requirements have been met and the selection of a Ph.D. Qualifying Examination Committee will be initiated.

Students must have full-time status during the quarter in which they take their QE. The QE must be taken as soon as coursework has been completed, typically by the 9th quarter. In no instance can the exam be taken later than two quarters before the completion of the doctoral program.

The Doctoral Qualifying Examination may be used to fulfill certain requirements for the M.S. Plan II degree, see Master of Science Degree Requirements.

2. **Written Portion of the Exam – Research Proposal**  
The student must submit a research proposal to each committee member at least 10 days before the oral portion of the exam. 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.

3. **Oral Portion of the Exam**  
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.

4. **Outcome of the Exam**  
The committee will reach a decision on the student’s performance immediately after the oral exam. The committee, having reached a unanimous decision, shall inform the student of its decision to:

- “Pass” (no conditions may be appended to this decision),
- “Not Pass” (the Chair’s report should specify whether the student is required to retake all or part of the examination, list any additional requirements, and state the exact timeline for completion of requirements to achieve a “Pass”), or
- “Fail”.

If a unanimous decision takes the form of “Not Pass” or “Fail”, the Chair of the QE committee must include in its report a specific statement, agreed to by all members of the committee, explaining its decision and must inform the student of its decision. Having received a “Not Pass” the student may attempt the QE one additional time; the QE report must list the specific conditions and timing for the second exam. After a second examination, a vote of “Not Pass” is unacceptable;
only “Pass” or “Fail” is recognized. Only one retake of the qualifying examination is allowed. Should the student receive a “Fail” on the first or second attempt at the exam, the student will be recommended for disqualification from the program to the Dean of Graduate Studies. In the event that the committee is unable to reach a unanimous decision, the outcome will be resolved through the Dean of Graduate Studies as well as the Graduate Council, in accordance with the procedures detailed in the Graduate Advisers Handbook GS-202.

c) The Dissertation

1. Exit Seminar
   The dissertation follows Plan B with a required exit seminar. The exit seminar is open to the public. At least three faculty, who are members of the Ph.D. Dissertation Reading Committee or were members of the Qualifying Examination Committee for the student, must be in attendance. Upon completion of the exit seminar, students must submit an Exit Seminar Verification form. This form (and the seminar) must be completed before the dissertation can be filed. An exit seminar notice will go out to graduate program members and graduate students in the department. The student will provide the Graduate Program Coordinator with the date, time, location, major professor and abstract one week prior to the seminar.

2. Dissertation: General Requirements
   Filing of a Ph.D. dissertation with the Office of Graduate Studies is normally the last requirement satisfied by the candidate. The deadlines for completing this requirement are listed each quarter in the campus General Catalog (available online at the website of the Office of the Registrar or from the Bookstore). A candidate must be a registered student or in Filing Fee status at the time of filing a dissertation, with the exception of the summer period between the end of the Spring Quarter and the beginning of Fall Quarter. The Ph.D. Dissertation will be prepared, submitted and filed according to regulations instituted by the Office of Graduate Studies (http://gradstudies.ucdavis.edu/students/filing.html). Satisfaction of this requirement must be verified by the Dissertation Reading Committee Chair.

3. Dissertation:
   The doctoral dissertation should be an original 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.

9) Normative Time to Degree
   For students not in possession of an M.S. degree upon admission to the Ph.D. program, the Normative Time to Advancement to Candidacy is 9 quarters. For students in possession of an M.S. degree, the Normative Time to Advancement to Candidacy is 6 quarters. Normative Time in Candidacy is 9 quarters.
10) **Typical Time Line and Sequence of Events**

The timeline below is typical for students not in possession of an M.S. Degree upon admission. For students in possession of an M.S. Degree upon admission the sequence of events listed in Year Two is typically not applicable, and may be skipped.

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<th>Year One</th>
<th>Fall</th>
<th>Winter</th>
<th>Spring</th>
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<td>Declare Major Professor</td>
<td>Preliminary Examination</td>
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<td>Advanced Language Training (if applicable)</td>
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<td>EEC 390 The Teaching of Electrical and Computer Engineering</td>
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<th>Spring</th>
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<td>Qualifying Examination</td>
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<td>Advancement to PhD candidacy</td>
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| Years Four-Six | | | |
|                | Dissertation Research and Completion | | |

11) **Sources of funding.**

Sources of funding in the ECE Graduate Program include: ECE Graduate Program fellowships, Graduate Student Researcher appointments and Teaching Assistantships. Funding decisions related to fellowships are generally made by the graduate program executive committee or Graduate Studies, depending on the source of funding for the fellowship. Not all fellowship funding decisions are made by either the graduate program executive committee or Graduate Studies; as examples, graduate students often seek fellowship funding directly from the National Science Foundation, National Institutes of Health, foundations, and a range of other agencies and organizations. Funding decisions related to Graduate Student Researchers are made by the Principal Investigator of the source of funding. Teaching Assistant appointment decisions are made by the Undergraduate Program Chair approximately four weeks prior to the start of each quarter and are based, in part, on a graduate student’s educational background, grade point average,
academic standing, degree objective, feedback from instructors, and recruitment status at the time of entering the graduate program.

12) **PELP, In Absentia and Filing Fee status.**
Information about PELP (Planned Educational Leave), In Absentia (reduced fees when researching out of state), and Filing Fee status can be found in the Graduate Student Guide: https://gradstudies.ucdavis.edu/postdoctoral/forms-information/guides-handbooks.

In order to be approved for filing fee status, a student must submit the filing fee request along with signatures of all three members of the Ph.D. Dissertation Reading Committee stating they have received an acceptable working draft of the dissertation. This application must be routed through the ECE Graduate Program Coordinator for the ECE Graduate Adviser’s approval and then must be filed with Graduate Studies. Filing Fee is available for one quarter only, but extensions may be approved on a case-by-case basis. In the event that filing fee status expires, the student must file a readmission application.

13) **Leaving the Program Prior to Completion of the Ph.D. Requirements.**
Should a student leave the program prior to completing the requirements for the Ph.D., they may still be eligible to receive the Master’s if they have fulfilled all the requirements (see Master’s section). Students can use the Change of Degree Objective form available from the Registrar’s Office: http://registrar.ucdavis.edu/local_resources/forms/D065-graduate-major-degree-change.pdf.