

**GRADUATE STUDENT MANUAL  
(POLICIES AND PROCEDURES)**

**2016 - 2017**



**ELECTRICAL & COMPUTER ENGINEERING DEPARTMENT**

The Marlan and Rosemary Bourns College of Engineering  
University of California, Riverside  
Suite 343 Winston Chung Hall  
Riverside, California  
92521

# I. General Graduate Program Policies

## A. Introduction

The Department of Electrical & Computer Engineering (ECE) at the University of California, Riverside (UCR) offers advanced study and research in specialized areas of Electrical Engineering (EE). Two degree programs are currently offered: the Master of Science (M.S.) in EE, and the Doctor of Philosophy (Ph.D.) in EE. The information contained in this manual is intended for graduate students in these two programs.

It is strongly recommended that EE graduate students familiarize themselves with the information in this document. Note that the Department reserves the right to modify the program requirements and policies, and changes do occur regularly (but they are generally not retroactive). Therefore, it is crucial that students refer to the Graduate Manual from the academic year of their admission to the program.

In addition to the EE-program-specific policies described here, the UCR Graduate Division determines the general regulations and policies that apply to all graduate programs at UCR. Information about these can be found at the following sources:

- Graduate Division Website: <http://graduate.ucr.edu>
- UCR General Catalog: <http://www.catalog.ucr.edu>

The Department may specify more rigorous requirements for the degree than listed in these other sources. Therefore, **when there appears to be a conflict in requirements for the degree, the more rigorous requirements must be satisfied.**

## B. Policies Common to both the M.S. and Ph.D. Programs in EE

Graduate students in both the M.S. and Ph.D. programs are required to meet a number of requirements set by the ECE Department and UCR Graduate Division. This section describes key requirements, but please keep in mind that this list may not be comprehensive. Please refer to the Graduate Division's website for additional information, as well as to Sections II and III for the requirements specific to the M.S. and Ph.D. programs, respectively.

### 1. Full-time enrollment

All graduate students are expected to carry a full academic course load. Exceptions can only be made in extraordinary cases, after petition. Graduate students are considered to be full-time if they are carrying 12 graduate units. When the student takes both graduate and undergraduate courses, special rules are used to determine full-time enrollment. Details are found at <http://graduate.ucr.edu/registration.html>

### 2. Standards of Scholarship

The following is an excerpt from the UCR Graduate Council Policy on Academic Standards. The full policy is on the Office of Graduate Division website at: <http://graduate.ucr.edu/requirements.html>

All students must demonstrate acceptable progress toward their degree objectives. This entails the satisfactory completion of all course work and other degree requirements in a timely fashion. Students

are considered to be making unacceptable progress and become subject to dismissal when **any of the following** happens:

- they have 12 or more units of "I" grades outstanding
- the overall GPA falls below 3.00
- the quarterly GPA falls below 3.00 for two consecutive quarters
- they fail to take their oral qualifying exams within five years
- they fail to fulfill program requirements, such as exams or research, in a timely and satisfactory manner
- Ph.D. students have not found a Faculty Advisor by the third quarter of their studies
- they have not completed their programs within one year after reaching the normative time
- they fail to pass comprehensive or qualifying examinations in two attempts; or
- they fail to make progress in research for two consecutive quarters

### 3. Time limits

The M.S. Program in EE requires one year of academic residence. Normative (i.e., typical) time is 2 years. The Ph.D. Program requires at least 2 years of academic residence, with normative time 3.5 years for students holding an M.S. degree in EE and 5 years for other students. The maximum time limit for either degree is one year beyond the normative time, excluding approved leaves of absence.

### 4. Deadlines

**It is the responsibility of the student to meet all deadlines specified by the ECE Department and the Graduate Division.** Students should consult the Graduate Student Handbook of the Graduate Division and the quarterly UCR Class Schedule for deadline information.

### 5. Coursework requirements

Both the M.S. and the Ph.D. program have minimum coursework requirements: M.S. students are required to complete 48 units of approved courses, and Ph.D. students are required to complete 36 units of approved graduate courses. Please refer to Sections II and III for specific details on which courses may or may not be counted towards the unit requirements.

**In any case, for a graduate student only the grades A+, A, A-, B+, B, B-, C+, C and S represent satisfactory scholarship and may be applied toward degree requirements.**

### 6. Colloquia

All graduate students are required to register for three quarters of the EE 259 Colloquium in Electrical Engineering course. Colloquia announcements will be posted on Department bulletin boards, on the ECE website, and via email. It is the student's responsibility to watch for the announcements and attend all Department colloquia. If a course/TA assignment conflicts with a seminar, a student must notify the Graduate Student Services Advisor prior to the start of the seminar. Only two unexcused absences are

allowed per quarter. **EE 259 units cannot be counted towards the minimum-unit requirements.**

## **7. Selecting a Faculty Advisor**

All graduate students must select a Faculty Advisor, who provides mentorship and guidance on research matters and/or course selection. Upon admission to the EE graduate program, new students are assigned a preliminary Faculty Advisor (e.g., the Graduate Program Advisor) to assist with course selection and general curriculum guidance. For M.S. students on the Exam Plan, this initial choice is typically sufficient. However, **Ph.D. students and M.S students on the Thesis Plan should select a Faculty Advisor whose research interests are aligned with their own, as soon as possible.** Ideally, each student should identify an advisor within the first quarter of study. Ph.D. students with a UCR Fellowship, who were sponsored for admission by a specific faculty member, are expected to begin participating in research activities under the sponsoring Professor's direction upon arrival to UCR.

**Ph.D. students who have not found a Faculty Advisor by the third quarter of their studies at UCR are considered to be making unacceptable progress towards their degree.**

The Faculty Advisor must be consulted in the planning of programs of study, research directions, and forming of committee(s). Especially for Ph.D. students and M.S. students working towards a Thesis, finding an Advisor that is a good match in terms of research objectives and personal communication style is crucial. Students and advisors should make every effort to maintain good working relationships.

## **8. Submission of a course plan**

To ensure that new graduate students have a concrete and appropriate plan for selecting courses and preparing for the Preliminary/Comprehensive exam, all incoming graduate students are required to submit a plan of the courses they intend to take until their Advancement to Candidacy. The course plan should be designed in coordination with each student's Faculty Advisor. Approval from both the Faculty Advisor and the ECE Graduate Program Advisor is required. Changes to the course plan at a later date are possible, after approval by the Graduate Program Advisor.

## **9. Annual student review**

An overall written evaluation of each student's academic progress is performed by the student's Faculty Advisor, in consultation with the student, at the end of each academic year. This evaluation includes a brief review of the student's work, and sets academic objectives for the next period. The Graduate Program Advisor, the Graduate Division, and the student receive copies of this report.

## **10. Application to Graduate**

All students must submit an Application to Graduate through R'Web by Monday of week 4 of their planned graduation quarter.

## **11. Familiarity with Academic Integrity policies**

All students should become familiar with and follow UCR's Academic Integrity Policies, described at [http://graduate.ucr.edu/academic\\_integrity.html](http://graduate.ucr.edu/academic_integrity.html). In case of any suspected Academic Misconduct, the University's procedures described in the above link will be followed.

## **12. Professional development (PD) requirement**

Students are expected to work towards developing their professional skills (including presentation and technical writing skills) during their graduate studies. To aid in this goal, and meet the program's PD requirement, students are required to register for three quarters of EE 259, as mentioned earlier.

## II. Master of Science Program

Students in the M.S. degree obtain mastery of an area of Electrical Engineering through coursework and, optionally, through the completion of a Master's Thesis. Students in the M.S. program must choose one of the following two plans for degree completion:

<b>Plan I (Thesis plan)</b>	Requires completion of 48 units of coursework, and writing a Master's Thesis that reports an original investigation of a defined problem.
<b>Plan II (Exam plan)</b>	Requires completion of 48 units of coursework, and passing a Comprehensive Exam.

The following tables summarize the key milestones of the M.S. program for each of the two plans.

<b>Timeline of M.S. Plan I (Thesis Plan)</b>	
Submit a course plan, drafted in consultation with Faculty Advisor and/or Graduate Program Advisor	Start of program
Find a Faculty Advisor	As soon as possible
Take classes and work on thesis	Normally between one and two years
Submit Advancement to Candidacy form and printed Degree works audit	First week of desired quarter of graduation
Submit application to graduate through R'Web	By Mon. of 4 <sup>th</sup> week of graduation quarter
Present M.S. Thesis, and submit approved Thesis to Graduate Division	Quarter of graduation

<b>Timeline of M.S. Plan II (Exam Plan)</b>	
Submit a course plan, drafted in consultation with Faculty Advisor and/or Graduate Program Advisor	Start of program
Take classes	Normally between one and two years
Submit Advancement to Candidacy form and printed Degree works audit	First week of desired quarter of graduation
Submit application to graduate through R'Web	By Mon. of 4 <sup>th</sup> week of graduation quarter
Register for the Comprehensive Exam	One month prior to exam
Take Comprehensive Exam	Exam is offered at the end of each Fall and Spring quarter

In what follows, additional details about the requirements and milestones of the M.S Program are provided.

## **A. Coursework requirements for the M.S. Program**

Successful completion of graduate coursework is a key component of the M.S. Program. Starting in Fall 2016, the M.S. Program requires completion of a **minimum of 48 units of approved coursework in EE and related areas. At least 36 of these units must be in graduate-level courses numbered between 200 and 279. Colloquium units cannot be counted towards degree requirements.**

Students should come up with a course plan that suits their focus area of interest, in consultation with their Faculty Advisor and/or the Graduate Program Advisor. The bulk of the courses taken by students in the M.S. program must be “formal” graduate-level courses, but students may also take approved undergraduate courses, as well as “informal” graduate courses in the EE29X series (see Section V.C for details on these courses). Coursework must be approved by the Graduate Program Advisor by submitting a course plan.

Only **approved** upper-division undergraduate courses numbered 125 and above, and up to 6 units of EE 290 courses, may be counted towards M.S. degree requirements. Students on the Thesis plan may use up to 12 units of EE 297/299 units. Students on the Exam plan may **not** enroll in EE 297/299 units.

Note that all the unit requirements listed above are **minimum requirements**. Students may choose to enroll to a higher number of courses than what is needed to meet the minimum limits, or may need to take courses to cover prior deficiencies. These courses will be listed normally in the students’ transcripts, but will not be used towards satisfying the degree requirements.

**Remedial courses, such as those required as prerequisites to the core EE graduate classes, will not be allowed to count toward the degree requirements.**

## **B. Advancement to Candidacy**

Students must be advanced to candidacy for M.S. degree no later than the first week of the quarter in which their degree is expected to be awarded. Deadlines for submission are published each quarter in the Schedule of Classes and in the annual Graduate Division Calendar. If the application is not received by the deadline date, the degree may be deferred until the following quarter. If the Master's degree requires a thesis (Plan I), a thesis committee should be nominated at the time the student files for advancement to candidacy.

The Master's degree is conferred at the end of the academic quarter in which all requirements have been satisfied (the official conferral day is the last day of the quarter). The students must have been formally advanced to candidacy during the quarter in which they finish their degree.

## **C. Plan I: thesis requirement**

Master’s students that choose the Thesis Plan (Plan I) are required to write and present a Master’s thesis as part of the degree requirements. A student planning to write an M.S. thesis should find a Faculty Advisor as soon as possible, preferably within the first quarter of study. The Faculty Advisor will work together with the student to define a problem that the thesis will study, and provide guidance to the student.

Once the thesis is completed, the student must present it to an M.S. thesis committee in a seminar presentation open to the public. The M.S. thesis committee consists of three members, and all three members must approve the thesis and sign the title page upon approval.

**MS Thesis Committee Members:** A student proposes the members of the M.S. thesis committee by submitting the Advancement to Candidacy form and Dissertation/Thesis Committee Nomination/Change form (two page form) along with a printed copy of the R'Web Degree Works degree audit. Upon approval by the Graduate Program Advisor and Graduate Dean, the committee is appointed, and becomes fully responsible for the student's academic guidance and evaluation. The following rules apply for the committee:

- The committee must consist of at least 3 members, the majority of whom must be affiliated with the ECE Department.
- All committee members should normally be voting members of the UC Academic Senate. Any exceptions must hold a Ph.D. and be qualified for a UC faculty appointment. To request an exception, **a curriculum vitae and a memo justifying the appointment must be submitted via email to the Graduate Student Services Advisor at the time of submitting the application for candidacy form.** A memo need not be written for those holding Adjunct faculty positions. Exceptions will be reviewed on an individual basis.
- In all cases, the absolute majority of the committee must be members of the UCR academic senate.
- To avoid conflicts of interest or the appearance of a conflict of interest, when domestic partners or spouses are a majority of the faculty overseeing a thesis, another faculty member will be added to that committee.

The committee's chairperson is normally the student's Faculty Advisor, and

- Must be an ECE faculty member
- Must be a voting member of the UC Academic Senate. Adjunct Faculty and Cooperative Extension Specialists may serve as sole chairs of committees if the Graduate Dean approves and at least one Senate member is on the committee. Requests for such exceptions are reviewed on a case-by-case basis.

#### **D. Plan II: comprehensive exam requirement**

Students that choose to Plan II for degree completion are required to pass a Comprehensive Exam. The exam is administered by the Graduate Committee twice a year, **at the end of the Fall and Spring quarters.** It is a five-hour long, written, closed-book exam. It consists of five questions selected from **one** of the following three subject areas:

- Computer Engineering
- Nano-materials and Devices
- Signals, Systems, and Machine Intelligence

When registering to take the exam, a student must select one of these three subject areas, and five subjects (courses) within this area (see Section IV for course listings). Test problems will draw primarily from material related to graduate courses; however, a minor portion of the test may involve problems from closely related material.

**To take the exam, the students must register by notifying the Graduate Student Services Advisor at least one month prior to the exam date.**

A student is allowed a maximum of two attempts at passing the exam. A student who failed in the first



attempt has two options: he/she may switch to Plan I, or must take the examination again at the time of **the immediate next offering**. On the second attempt, students only need to re-take the exam in subjects that they failed the first time. A student who has failed the examination twice is removed from the program. A student who registered for an exam but did not show up is considered to have failed.

**Students must pass the Comprehensive exam at any time prior to the end of the second year of their studies.** Exceptions can be made for those students who were admitted to the program with substantial deficiencies in their education, and for this reason were assigned to the remedial undergraduate courses covering these deficiencies.

Normally, students should take the Comprehensive exam after completing all coursework. However, it is possible to take the exam at an earlier time, if desired. For example, if a student admitted in Fall 2016 is planning to graduate in December 2017, he/she may elect to take the exam at the end of Spring 2017. In this way, if the student fails at the first attempt in Spring, he/she may re-take the exam in December 2017, and graduate at the intended time (assuming the student passes the second time).

### III. Doctor of Philosophy Program

The main component and focus of the Ph.D. program is the independent research culminating in a Ph.D. thesis. Students should find a Faculty Advisor and participate in research activities as soon as possible. However students must also take courses, to help them establish both breadth and depth of knowledge in their area of research. The following table shows the typical timeline of the Ph.D. program:

Timeline of Ph.D. degree	
Submit a course plan, drafted in consultation with Faculty Advisor and/or Graduate Program Advisor	Start of program
Start research with Faculty Advisor	Start of program
Take classes	Unit requirements must be completed within first 2 years
Pass Preliminary Exam	Before the end of second year (normally at end of first year)
Pass Oral Qualifying Exam	Before the end of second year
Continue research, write Ph.D. Thesis	Normally 3.5 to five years from start of program
Submit application to graduate through R'Web	By Mon. of 4 <sup>th</sup> week of graduation quarter
Defend Ph.D. Thesis, submit it to Graduate Division	Quarter of Graduation

In what follows, additional details about the requirements and milestones of the Ph.D. program are provided.

#### A. Coursework requirements for the Ph.D. Program

The Ph.D. program **requires completion of at least 36 units of approved graduate coursework in EE and related areas. Only courses numbered between 200 and 279, excluding Colloquium courses, may be counted towards this requirement.**

While Ph.D. students **may take courses at any time until graduation**, the above stated coursework requirements must be completed prior to the student's advancement to candidacy.

Note that this requirement is only a **minimum requirement**. Students may need to take considerably more than 36 units of coursework in order to establish breadth and depth of knowledge. Students should design an appropriate course plan in coordination with their research advisor or the ECE Graduate Program Advisor. While only "formal" graduate courses (i.e., courses numbered between 200 and 279, excluding colloquiums) may be counted towards the Ph.D. degree requirements, students may additionally take undergraduate courses and "informal" courses as needed in order to complement their

research program.

Students who have already taken 36 units of graduate coursework at UCR as part of the M.S. program in Electrical Engineering are deemed to have met the minimum-unit requirement for the Ph.D. Students who are admitted with an M.S. degree from a different institution may use up to 16 units of equivalent courses taken during their M.S. study to count towards the requirement.

## **B. Ph.D. Preliminary Exam**

The purpose of the Preliminary Exam is to screen candidates for continuation in the doctoral program. This exam is a written, closed-book exam, consisting of questions in five subjects within one major area, similarly to the M.S. comprehensive examination (see Section II.D). Two main differences exist between the Ph.D. preliminary examination and M.S. comprehensive examination: First, Ph.D. students must select three problems from the “basic” courses and two from the “advanced” courses designated in their major subject area. Second, Ph.D. students will be exempt from problems on courses for which they received a grade of “A” or higher.

Students who did not pass all five problems at the Ph.D. level on their first attempt will be given a second chance, where they will be required to solve problems only from the courses they did not pass at the Ph.D. level in their first attempt.

The normative time for taking the preliminary exam is by the end of the student’s third quarter. Students must pass this exam by the end of the second year, otherwise they are considered to be making unacceptable progress towards their degree.

The Ph.D. Preliminary Exam is offered simultaneously with the M.S. Comprehensive Exam, at the end of the Fall and Spring quarters. **To take the exam, the students must register by notifying the Graduate Student Services Advisor at least one month prior to the exam date.**

Plan II M.S. candidates who took the M.S. comprehensive exam, successfully passed courses at the Ph.D. level, and are then admitted to the Ph.D. program, are given credit for having passed the Ph.D. preliminary exam for those courses. Please refer to Section IV for the list of basic and advanced courses in each area.

## **C. Ph.D. Oral Qualifying Exam**

After passing the preliminary examination, the students are expected to demonstrate that they have a thorough understanding of their research field, and are capable of doing cutting-edge research. For that purpose, students must choose a research topic under the guidance of their Faculty Advisor and orally present to the Ph.D. Qualifying Committee.

**The presentation must be accompanied by a written report**, written in proper technical English and in the style of a typical Electrical Engineering conference or journal publication. This report should clearly describe the proposed problem under study, demonstrate substantial knowledge of the topic and related issues, present the research results the student has obtained, and describe future research plans. The report must be delivered to the committee members at least **one week** prior to the exam.

Through both the oral presentation and the written report, students must demonstrate ability to carry out a program of independent research and to report the results in accordance with standards observed in recognized technical journals. Based on the written report and the oral presentation, a recommendation

will be made by the Qualifying Committee that the student either 1) passes the exam, or 2) revises the report and/or the presentation and re-takes the exam, or 3) withdraws from the Ph.D. program.

**To take the Oral Qualifying Exam, students must follow the checklist and adhere to the deadlines shown on the Table on the next page.**

The student must pass this exam in no more than two attempts. The normative time for taking the Oral Qualifying Exam is by the end of the second year.

The Oral Qualifying Examination is closed to the public.

**The Ph.D. Qualifying Committee** must consist of five members, the majority of whom but not all, must be affiliated with the ECE Department. Additionally, the following rules apply:

- All committee members should normally be voting members of the UC Academic Senate. Any exceptions must hold a Ph.D. and be qualified for a UC faculty appointment. To request an exception, **a curriculum vitae and a memo justifying the appointment must be submitted via email to the Graduate Student Services Advisor at the time of submitting Form 2.** A memo need not be written for those holding Adjunct faculty positions. Exceptions will be reviewed on an individual basis.
- In all cases, the absolute majority of the committee must be members of the UCR academic senate.
- The chairperson is normally the student's Faculty Advisor. The chairperson must be a voting member of the UC Academic Senate, and must be affiliated with the ECE Department.
- At least one member of the Qualifying Committee, designated the "outside member," must be a voting member of the UC Academic Senate who does not hold an appointment in the ECE department. The "outside member" cannot be an ECE Cooperating Faculty.
- The outside member does not need to have special expertise in the area of the student's dissertation; this member's academic field may be unrelated to the field of study of the student and the other committee members. This person represents the faculty at large, and acts as a "third party ensuring fairness."

**Change of Committee Membership Process:** If a change needs to be made to a student's approved Oral Qualifying Examination Committee, a new Dissertation/Thesis Committee Nomination form should be submitted as soon as possible to the Graduate Student Services Advisor. If the Chair of the committee is being changed, Dissertation/Thesis Committee Nomination form must be accompanied by a memo of explanation via email. In order to meet Graduate Division Deadlines, **all changes to committee should be submitted to the Graduate Student Services Advisor as early as possible, but no later than one week in advance of the exam date.**

Additional information for the Qualifying Exam can be found at <http://graduate.ucr.edu/doctoral.html>

#### **D. Advancement to Candidacy**

After successful completion of the Preliminary and Oral Qualifying examinations and completion of all University and departmental requirements, the student is eligible for formal advancement to candidacy. The student will be billed the Candidacy Fee after the degree check has been completed. After a successful degree check, the student and ECE are notified of the formal advancement to candidacy.

### Checklist of requirements for the Oral Qualifying Exam

1. Review your degree audit via R'Web (see Degree Audit icon under your authorized applications menu). Confirm all course requirements have been or will be completed by the end of the quarter you wish to advance to candidacy. Discuss any discrepancies with Kim at kim@ece.ucr.edu. **You should check your degree audit by the first week of the quarter prior to your Oral Qualifying Exam.**
2. Work with your Faculty Advisor to determine the five faculty members (including your faculty advisor as chair and one faculty from another Department who will be your outside member).
3. Confirm that all members are willing to serve on your committee, and find a suitable date and time that works for everyone in the committee. Doodle [www.doodle.com](http://www.doodle.com) is a helpful scheduling tool.
4. After a time that works for all committee members is agreed upon, prepare Form 2 found here: <http://graduate.ucr.edu/forms/Form%202.pdf> and print a copy of your R'Web degree audit. Return both your Form 2 and degree audit to 343 WCH in order to obtain the Grad Advisor approval. **You should submit your Form 2 and your printed degree audit one month prior to your Oral Qualifying exam. If any nominee for the committee is not a member of the UC Academic Senate, a curriculum vitae and a memo justifying the appointment must be submitted via email to the Graduate Student Services Advisor at the time of submitting Form 2.**
5. Reserve a room (and check out a projector if needed) at the ECE front desk at 343 WCH. You should check the A/V in the room before your exam and plan for a projector, if needed. After you schedule your room, contact all committee members again to confirm the date/time/location.
6. Graduate Division will email you with approval of your Oral Exam Committee on your Form 2. **Check the form for accuracy** and email Kim at kim@ece.ucr.edu ASAP if any issues exist.
7. **You must send your written report to your entire committee a minimum of one week in advance of your exam.** Please refer to Section III.C regarding the requirements for this document. **If you fail to adhere to the deadline to send your report to your committee, you may fail your exam.**
8. Prior to your exam, prepare Form 3 found here [http://graduate.ucr.edu/forms/Form\\_3.pdf](http://graduate.ucr.edu/forms/Form_3.pdf) and bring your Form 3 to your Oral Exam.
9. Immediately after your exam, return your completed Form 3 to 343 WCH ECE Department front desk. Make sure your Form 3 is signed by all your committee members and lists your dissertation committee. **You should return your Form 3 to the ECE Department immediately after your exam.**

#### E. SPEAK test requirement

Ph.D. students whose native language is not English and are promised TA (or TA/GSR) support as part of their UCR admission offers, must pass the SPEAK test prior to the start of their second year of study. If they do not meet the SPEAK test requirements at the time they are offered a TA position by

the Department (and thus are not eligible for a TA position), they will be considered to have declined their appointment. The SPEAK test requirements for TA eligibility are described in Section V.B.

#### **F. Ph.D. dissertation defense and degree conferral**

A student's Ph.D. Dissertation Committee is nominated using Ph.D. Form 3. The committee consists of at least three Academic Senate faculty members with at least two members from the ECE department. Please refer to <http://graduate.ucr.edu/doctoral.html> for additional rules regarding the selection of Ph.D. Dissertation Committee members.

After completion of the dissertation research, a written copy of the dissertation must be submitted to and approved for defense by the student's Ph.D. Dissertation Committee. Once a draft has been approved for defense, an oral defense of the dissertation will be scheduled. This defense consists of a seminar open to the entire academic community, followed by a question/answer period conducted by the Ph.D. Dissertation Committee.

Upon completion of the defense and approval of the dissertation, the Doctoral Committee recommends, by submission of Ph.D. Form 5 (Report of Final Examination), that the Ph.D. be conferred. All members of the committee must sign the form. Additionally, two copies of the dissertation must be submitted to the Graduate Division. All Ph.D. students are required to follow the checklist at <http://graduate.ucr.edu/dissertation.html> for the steps needed, and applicable deadlines.

Ph.D. degrees are conferred, as of the last day of the regular academic quarter in which all requirements have been satisfied, including the final positive recommendation of the Doctoral Committee, and the acceptance of the approved dissertation by the Graduate Division and processing by the Registrar's Office. A graduate student must be registered or on Filing Fee status the quarter in which the dissertation is submitted and the degree is to be conferred. No fee for filing the manuscript itself is required.

## IV. Course listings for the Comprehensive/Preliminary Exams

When registering for the Preliminary/Comprehensive exam, students must choose their major subject area (either Computer Engineering; or Nano materials and Devices; or Signals, Systems, and Machine Intelligence), and five subjects within this area to take the exam on. In this section, we list the courses that count as Basic and Advanced within each of the three areas. Please refer to the UCR General Catalog (<http://www.catalog.ucr.edu/>) for descriptions of the courses.

Please be advised, the following course listings are **only intended to be used for selecting courses for the Preliminary/Comprehensive exam**. In registering for courses, students may choose any courses that are suitable for their study and research objectives, in consultation with their Faculty Advisor and/or the Graduate Program Advisor. Each student's course plan may include courses listed under different subject areas, and may include both graduate and undergraduate courses in Electrical Engineering and related subject areas, as long as the minimum unit requirements are satisfied (see Sections II and III).

Computer Engineering	
BASIC COURSES	
EE 213	Computer-Aided Electronic Circuit Simulation
EE 221	Radio-Frequency Integrated Circuit Design
EE 235	Linear System Theory
CS 202	Advanced Operating Systems
CS 203	Advanced Computer Architecture
CS 218	Design and Analysis of Algorithms
ADVANCED COURSES	
EE 201	Applied Quantum Mechanics
EE 202	Fundamentals of Semiconductors and Nanostructures
EE 203	Solid State Devices
EE 215	Stochastic Processes
EE 217	GPU Architecture and Parallel Programming
EE 219	Advanced CMOS Technology
EE 222	Advanced Radio-Frequency Integrated Circuit Design
EE 230	Mathematical Methods for Electrical Engineering
EE 248	Computer-Aided Logic Synthesis for Digital Systems
EE 252	Data Center Architecture
EE 258	Modeling and Synthesis of Cyber-Physical Systems
CS 213	Parallel Processing Architectures
CS 220	Synthesis of Digital Systems
CS 269	Software and Hardware Engineering of Embedded System

## Nano-materials and Devices

### BASIC COURSES

EE 201	Applied Quantum Mechanics
EE 202	Fundamentals of Semiconductors and Nanostructures
EE 203	Solid State Devices
EE 205	Optoelectronics and Photonic Devices
EE 206	Nanoscale Characterization Techniques
EE 215	Stochastic Processes

### ADVANCED COURSES

EE 204	Advanced Electromagnetics
EE 207	Noise in Electronic Devices
EE 208	Semiconductor Electron, Phonon, and Optical Properties
EE 209	Semiclassical Electron Transport
EE 212	Quantum Electron Transport
EE 214	Quantum Computing
EE 216	Nanoscale Phonon Engineering
EE 219	Advanced CMOS Technology
EE 220	Applied Ferromagnetism
EE 223	Numerical Analysis of Electromagnetic Devices
EE 230	Mathematical Methods for Electrical Engineering
PHYS 221A,B	Quantum Mechanics
PHYS 234	Physics of Nanoscale Systems
PHYS 235	Spintronics and Nanoscale Magnetism
PHYS 240A,B,C	Condensed Matter Physics
PHYS 242	Physics at Surfaces and Interfaces
CHEM 202	Advanced Instrument Design
CHEM 203	Nanoscience and Nanotechnology
ME 272	Nanoscale Science and Engineering
BIEN 245	Optical Methods in Biology, Chemistry, and Engineering
MSE 210	Crystal Structure and Bonding
MSE 220	Materials Characterization Techniques



## Signals, Systems, and Machine Intelligence

### BASIC COURSES

- EE 210 Advanced Digital Signal Processing
- EE 215 Stochastic Processes
- EE 224 Digital Communication Theory and Systems
- EE 230 Mathematical Methods for Electrical Engineering
- EE 231 Convex Optimization in Engineering Applications
- EE 235 Linear System Theory
- EE 236 State and Parameter Estimation Theory

### ADVANCED COURSES

- EE 211 Adaptive Signal Processing
- EE 218 Power System Steady-state and Market Analysis
- EE 225 Error-Correcting Codes
- EE 226 Wireless Communications
- EE 232 Introduction to Smart Grid
- EE 237 Nonlinear Systems and Control
- EE 238 Linear Multivariable Control
- EE 239 Optimal Control
- EE 240 Pattern Recognition
- EE 241 Advanced Digital Image Processing
- EE 243 Advanced Computer Vision
- EE 244 Computational Learning
- EE 245 Advanced Robotics
- EE 246 Intelligent Transportation Systems
- EE 249 Power System Dynamics
- EE 250 Information Theory
- EE 252 Data Center Architecture
- EE 258 Modeling and Synthesis of Cyber-Physical Systems
- CS 218 Design and Analysis of Algorithms

## V. Additional Resources

### A. Key personnel and points of contact

The two key points of contact for current graduate students are the Graduate Student Services Advisor and Graduate Program Advisor, listed below. They can be of assistance in degree-related academic matters, as well as non-degree-related matters such as health services, housing, communication deficiencies, and career development.

**Graduate Student Services Advisor:** Kim Underhill (formerly Claffey). E-mail: [kim@ece.ucr.edu](mailto:kim@ece.ucr.edu)

**Graduate Program Advisor:** Prof. Anastasios Mourikis. E-mail: [mourikis@ece.ucr.edu](mailto:mourikis@ece.ucr.edu)

The administrative staff of the ECE Department is located in Suite 343 of Winston Chung Hall (WCH). A complete listing of the names and contact information of the ECE Department staff members can be found at <http://www.ece.ucr.edu/people>.

### B. Fellowships and graduate student employment (TAs and GSRs)

Financial awards may include research or teaching assistantships, and fellowships. Typically, teaching and research assistantships are awarded on a competitive basis, and include full or part-time salary and, in addition, payment of the Graduate Student Health Insurance Plan (GSHIP fee and a Partial Fee Remission (PFR). Non-resident students *may* also receive a partial or full non-resident tuition (NRT) remission.

**All students with fellowship are required to maintain a quarterly and cumulative GPA of 3.0 or higher, or they will lose their fellowship.**

Assistants are expected to aid faculty members in the instructional or research programs. A 50% appointment requires an average of 20 hours per week.

Administration and selection of teaching assistants (TAs) is done through the ECE department. The assignment of TAs to classes is performed as follows:

1. Prior to the start of each quarter the available TA positions are announced, and students who wish to be considered for TAs are required to apply. The announcement is made via e-mail to all graduate students. The application deadline is stated in the announcement, and depends on the time remaining for the beginning of classes. Multiple announcements may be made if additional TA positions become available after the first one.
2. The first priority for appointment goes to students who have unfulfilled TA commitments as part of their support package.
3. Remaining TA positions will be assigned to eligible students in the graduate program or in cognate programs.

Research assistants (termed Graduate Student Researchers, GSRs) are selected by the faculty members directing research projects and not by the department, and are supported by research

contracts and/or grants. However, faculty members consult with the Graduate Program Advisor and Graduate Student Services Advisor concerning the availability of qualified students seeking support.

**EE Ph.D. graduate students whose native language is not English (in particular, international students) must pass the SPEAK test or must score 23 or above on the Speaking portion of internet-based TOEFL (iBT) test to be eligible for TA positions.** The purpose of both tests is to evaluate English proficiency and comprehensibility.

Scores on the SPEAK test are as follows:

- 50 – 60: **Clear Pass**
- 40 – 45: **Conditional Pass**
- 20 - 35: **Fail**

The iBT is administered by EST and students take the test online. The score for the Speaking portion should be 23 or above to have the SPEAK test requirement waived, if assigned as a TA during your first academic term.

Any EE Ph.D. student who is assigned a TA position and does not have a “Clear Pass” in the SPEAK test must attend the English language classes offered at the UCR Extension Center until a “clear pass” is obtained. Students are provided with one quarter of free instruction at UCR Extension Center. If a student is still not able to obtain a Clear Pass, he/she is responsible for paying for the instruction until a “clear pass” is obtained on the SPEAK test. A student with a “conditional pass” can be appointed as a TA. However, these appointments will only be approved for one quarter at a time. Every quarter, a student with a conditional pass can continue serving as a TA only if approved by the Graduate Dean. This decision is made on the basis of:

- Departmental recommendation, including an assessment of the student's academic ability;
- Student teaching evaluations;
- Other evidence of commitment to/performance in teaching (e.g., faculty evaluations or statements of support, videotapes);
- Evidence of a good-faith effort to improve English skills; and
- Relative proximity to the level of competence represented by a clear pass.

All TAs are required to take the TADP workshop series offered by the Learning Center. The TA training should be completed in the first quarter a TA begins teaching. Students sign up for the workshop series online at <http://www.tadp.ucr.edu/>.

### **C. Informal Courses**

In addition to the “formal” courses given on a regular basis, faculty can offer *Informal Courses*. These courses are:

EE 290 Directed Studies	If you plan to study a particular subject under direction of a faculty member, and a regular course in that subject is not offered, you may enroll in EE 290. Students are required to file a petition no later than the third week of class to enroll in EE 290 to be able to use the units earned towards degree requirement.
EE 297 Non-thesis Research	If you are doing research under advisement of a faculty and this research is not directed toward your thesis or dissertation, you may enroll in EE 297
EE 299 Research for Thesis or Dissertation	If you are doing research under the supervision of your Faculty Advisor and this research is directed toward your thesis or dissertation, you may enroll in EE 299.

Informal courses require a narrative description on a request form and should be approved and signed by the instructor and Graduate Program Advisor .

#### **D. Filing Fee**

Students who have completed all degree requirements except for defending and filing the dissertation/thesis (for Ph.D. or Plan I M.S. students) or completing the Comprehensive Exam (for Plan II M.S. students) are eligible for Filing Fee Status during the final quarter of residence in lieu of paying registration fees. Students do **not** have to use Filing Fee status. Unless payment of a Filing Fee or a Leave of Absence is approved, all graduate students must register and pay fees each regular academic quarter (excluding Summer Session) until all degree requirements are completed - otherwise, student status and candidacy status will normally lapse.

For more information on the Filing Fee, please refer to <http://graduate.ucr.edu/registration.html>

#### **E. Transfer of Credits**

**M.S students:** Units from another University of California campus may be used to satisfy one of the three quarters of the residence requirement and may be counted for up to one half of the total units required for the M.S. degree. A maximum of 8 quarter units from institutions outside the University of California may be counted toward the M.S. degree at UCR.

**Ph.D. students:** Students who have already taken 36 units of graduate coursework at UCR as part of the M.S. program in Electrical Engineering are deemed to have met the minimum-unit requirement for the Ph.D. program. Students who are admitted with an M.S. degree from a different institution may use up to 16 units of equivalent courses taken during their MS study to count towards the requirement.

**ECE Department and Graduate Division approval must be obtained before any transfer units can be accepted for credit.**

All transfer work must have been completed in graduate standing with a minimum grade of "B." Unit

credit only is posted on the UCR transcript (grade points are not transferred).

For additional information regarding Credit Transfer policies, including courses taken as an undergraduate at UCR and at UCR Extension, please refer to <http://graduate.ucr.edu/registration.html>

## **F. Academic appeal procedures**

UCR has adopted a campus-wide graduate level academic appeals policy. To get more information, please visit [http://graduate.ucr.edu/academic\\_affairs.html](http://graduate.ucr.edu/academic_affairs.html) and scroll down to the section entitled "Appeal Procedures." In that section you will find a link to 1) program-level appeal procedures that apply to all departments and programs and govern appeals proceedings at the program level, and 2) campus-level appeal procedures that enable students and/or faculty to appeal decisions made at the program level to Graduate Division (and in special cases, to Graduate Council).

## **G. Grading**

**For a graduate student only the grades A+, A, A-, B+, B, B-, C+, C and S represent satisfactory scholarship and are applied toward degree requirements.**

Individual study and research, or other individual graduate work is normally evaluated by the grades Satisfactory/No Credit. Only the grade S is credited towards degree requirements. Academic work applicable to a graduate program may be graded S/NC only if the course descriptions so indicate. Undergraduate courses that do not have any significant relationship to the graduate program are considered electives. These courses may be taken S/NC with the approval of the Graduate Dean, and do not count towards the student's degree requirements.

The grade Incomplete (I) is given only when a student's work is satisfactory, but is incomplete because of circumstances beyond his or her control and the student has been excused in advance from completing the quarter's work. Although incomplete grades do not affect the student's GPA, they are an important factor in evaluating academic progress. **A student with 12 units of "I" grades is deemed to be making unacceptable progress. Students may not be employed as TA's, GSR's, or Teaching Fellows if they have more than 7 units of "I" grades.**

The incomplete portion of the work needed to earn a grade must be received by the instructor no later than the last day of the quarter following the assignment of the "I". If not made up within the time allowed, the "I" lapses to an F ("Fail") or NC. An advanced degree cannot be awarded if there is an Incomplete on the student's record.

## **H. Leaves of Absence**

A graduate student is expected to enroll for each regular academic session unless a formal Leave of Absence is granted. A Leave of up to one year's duration may be granted if it has been determined that the Leave is consistent with the student's academic objective. This must be approved by both the academic unit and the Graduate Dean.

Graduate students granted a Leave of Absence forfeit the use of University facilities and faculty time.

The student who will be absent from the campus while continuing to pursue graduate research or scholarly activity should register (in absentia if outside the State of California). Students who must leave the academic program for more than three quarters normally should withdraw and apply for readmission at the time they expect to resume graduate study at UCR.

A Leave ordinarily may be granted when a student is to be away from the University of California for one of the following reasons:

- Serious illness or temporary disability
- An occupation not directly related to the student's academic program
- Temporary interruption of the student's academic program for other appropriate reasons, such as family responsibilities

Generally, Leaves of Absence are limited to a total of three regular academic quarters and may be granted retroactively, after the start of a quarter, under exceptional circumstances. A Leave may not be granted if a student has not completed at least one quarter's work, or has not demonstrated satisfactory academic progress. (A student who has more than eight units of "I" outstanding on their transcript is considered to be making unsatisfactory progress.)

While on a Leave of Absence, a student is not eligible for University fellowship support, University research grants, or financial aid. A graduate student on Leave may not usually work on campus and may not hold an appointment as a Graduate Student Researcher, Teaching Assistant, or similar academic employment which requires full-time registration as a graduate student.

The immigration status of foreign students might be affected by a Leave depending on circumstances and whether they are staying in the U.S., or, returning to their own country. It is imperative that foreign students considering a Leave of Absence seek counseling at the International Students and Scholars Office.

Students should pick up a General Petition for a Leave of Absence from the Graduate Division or it can be downloaded from the Graduate Division's website. The petition must be signed by the Graduate Program Advisor, and a memo of justification from the department must be submitted with the petition.

The student is also required to secure the signatures of the Cashier and Business Office (to determine if there are any outstanding debts or loan provision that must be considered), and International Students and Scholars Office (if foreign) before a final decision can be made. The petition must be into the Graduate Division by the published deadline dates. While a Leave of Absence may be granted retroactively to the beginning of the current quarter, a request for Leave submitted after beginning of classes ordinarily should be accompanied by an explanation of the circumstances justifying the late request. Students should not expect an answer until two weeks after their petition has been submitted.

## VI. Miscellaneous information

### A. Facility access and keys

Winston Chung Hall uses card access for most of the doors in the building. The “key” is the student ID card, “UCR Connection Card,” students receive when first registered at UCR. Card key access to general EE graduate student areas is granted to students when they first apply for a computer and e-mail account during the graduate student orientation. This access will be continuous as long as a student is in good academic standing.

Access to research laboratories must be requested on a quarterly basis by the faculty member supervising the specific research laboratory. The Department Chair grants access to instructional laboratories to TAs on a quarterly basis. If regular keys are required for a specific door, a written request, approved by the student’s Advisor and Department Chair, must be submitted to the Department Manager. A \$5 deposit is required for each key, which is refunded when the key is returned. Replacement of damaged or lost cards is the responsibility of the students. Lost keys should be reported immediately to the Department Manager.

### B. Mail

Incoming mail and intercampus notices may be picked up from mailboxes in the mailroom in Room 107 inside the EE TA Office in Winston Chung Hall. Outgoing intercampus mail and official university mail can be deposited in the Departmental Administrative Suite in Room 343. **Students should send and receive all personal mail (e.g., personal letters, bills, non-technical magazines) from their personal residences.**

### C. Remuneration and disbursement

Direct Deposit statements are available on-line; students employed by other departments should verify the disbursement location and time from the administrative office of the employing department. The ECE Department strongly encourages each employee to participate in the Direct Deposit program. Should you desire a traditional paycheck, you will need to request a waiver and the paycheck will be sent to your residence via U.S. Postal Service (USPS). It is incumbent upon the employee to ensure your local address is current in the Payroll/Personnel System (PPS).

### D. Photocopying

There is a photocopier in the Administrative Suite that is available during regular office hours. Only graduate students copying material **associated with their duties as a research or teaching assistant** may use the photocopier. Personal photocopying, of materials such as notes, homework, exam solutions, textbooks or other items not associated with research or teaching assistant duties is not permitted.

The copying of copyrighted material must be accomplished through the Printing & Reprographics department. This ensures prevention of infringement of intellectual property rights; royalties, patents and other commercial protection authors of various printed works are entitled.

Research or teaching assistants should submit a request to the reception desk in Room 343 Winston Chung Hall for a copy access code. The request must first be approved by the student's Advisor or TA faculty supervisor. Photocopy charges will be billed to the appropriate account.

#### **E. Machine shop**

The machine shop facilities are located in the ground-floor of the laboratory wing of Bourns Hall, Room B155. Students may borrow equipment and use certain machine tools with supervision and prior approval of Paul Stovall, ME Principal Mechanician. Such use is limited to research and is not for personal work.

#### **F. Safety**

Safety precautions shall be exercised, observed and complied with at all times. **NO EXCEPTIONS!** All employees are required to attend General Safety Orientation and may be required to attend Laboratory Safety Orientation depending upon duties and tasks performed. In addition, lab specific or task specific training may be required depending upon requirements of the laboratory assigned or employed. Students must become acquainted with all safety rules and procedures before working in the machine shop or laboratories. Pavle Kirilov, is the department safety coordinator and can be reached at 2-2220 or [pavle@ece.ucr.edu](mailto:pavle@ece.ucr.edu).

#### **G. Computers**

Computers and a printer available for use by graduate students are located in the ECE Computer Labs. In addition, there are a number of computer labs distributed around the UCR campus, including the Science Library. Students should register for E-mail and network accounts on the ECE server when they first enroll for graduate studies. Registration forms and submittals can be obtained from the ECE Department Systems Administrator in Room 109 Winston Chung Hall.

Please check your email frequently; this is the primary method of information dissemination regarding deadlines, seminars, etc.

#### **H. University letterhead**

The use of University letterhead is for official business only. See your advisor should you feel the use of letterhead is warranted.

#### **I. Useful Links and Resources**

**Campus Police - non emergency calls only. For emergencies, dial 911**

<http://www.police.ucr.edu/>

3500 Canyon Crest Drive | (951) 827-5222

Adding the campus police's phone number to a cell phone will aid in getting assistance to your



classroom or lab quickly.

### **Campus Escort**

<http://www.escortservice.ucr.edu/>

(951) 827-3772

Free service – a campus escort will walk you to your car after night classes.

### **Career Center**

<http://www.careers.ucr.edu/index.html>

Veitch Student Center | (951)827-3631

Career counseling, assessment, workshops, and job search assistance.

### **City of Riverside (information about the city and surrounding areas)**

<http://www.riversideca.gov/>

### **Counseling Center**

<http://www.counseling.ucr.edu>

Veitch Student Center, North Wing | (951) 827-5531

Confidential, free, warm, and welcoming support to promote mental health, emotional resilience and wellness. Workshops, vocational testing and individual appointments available. TAs can refer students for appointments.

### **Dean of Students Family of Departments**

<http://deanofstudents.ucr.edu/>

(951) 827-4113

Access to student resources including Students Special Services, Women’s Resource Center, LGBT Resource Center, and the Student Recreation Center.

### **Electrical and Computer Engineering Homepage**

<http://www.ece.ucr.edu/>

### **Electrical and Computer Engineering Course Offerings**

<http://www.ece.ucr.edu/current-students/courseOfferings.html>

### **General Catalog Online**

<http://registrar.ucr.edu/registrar/schedule-of-classes/catalog.html>

### **Graduate Division**

<http://www.graduate.ucr.edu/>

For assistance with financial aid, funding opportunities, dissertation/thesis submission and more.

### **Graduate Division Student Handbook and Resources for Current Grads**

<http://graduate.ucr.edu/studentresources.html>

### **Graduate Writing Center**

<http://gwrc.ucr.edu/>

Free writing assistance with abstracts, grant applications, articles, CVs etc.

**R'Web**

<http://rweb.ucr.edu/>

Enrollment, grades, degree progress, pin, direct deposit sign-up, account and billing.

**International Students and Scholars Office**

<http://www.internationalcenter.ucr.edu>

Surge Building, Suite 0321 | (951)827-4113

Assistance for international students, instructors and faculty. Also offers opportunities abroad.

**Office of the Registrar**

[www.registrar.ucr.edu](http://www.registrar.ucr.edu)

Schedule of classes, catalog, registration and payment deadlines, transcript and diploma information.

**Ombudsman**

<http://www.ombudsperson.ucr.edu>

For assistance in resolving various conflicts (sexual harassment, fee disputes, instructor-student) on campus.

**Student Business Services**

<http://www.sbs.ucr.edu>

900 University Avenue | (951) 281-3204

Deferred tuition payment plans, loans and loan counseling, registrar.

**UCR Graduate Student Association**

<http://www.gsa.ucr.edu/>

**UCR Highlander Union Building (HUB)**

<http://www.highlanderunionbuilding.ucr.edu/pages/default.aspx>

**UCR Housing Office**

3595 Canyon Crest Drive | (951) 827-6350

<http://www.housing.ucr.edu>

**UCR Libraries**

<http://library.ucr.edu>