University of California
Davis

Graduate Program in Applied Science

GRADUATE STUDENT GUIDELINES

Revised September 24, 2007

Degree Requirements Approved by Graduate Council
on June 2, 2006

The purpose of these guidelines is to help graduate students in Applied Science become acquainted with the requirements and regulations affecting graduate studies.

Graduate work is performed under the supervision of faculty members who are organized in groups and departments. Because of this organizational structure, graduate students have to satisfy all the separate or joint requirements of the Graduate Studies Office, the College of Engineering, and the Graduate Program in Applied Science.

The requirements and regulations of the College of Engineering are given in the *Graduate and Undergraduate Engineering Bulletin*. Most of these Graduate Studies and College of Engineering requirements, as well as Department of Applied Science requirements, are described hereinafter. You can also check the UC Davis Graduate Studies website at: http://gradstudies.ucdavis.edu/. See Appendix B for general requirements for advanced degrees.

TABLE OF CONTENTS

1. GRADUATE ADVISERS

For the 2007-08 academic year the following professors will serve as Graduate Advisers:

Prof. Ann Orel
Prof. Niels Jensen

Each student will be initially assigned to one of the above advisers. Only these individuals can sign off on forms required by the Division of Graduate Studies. Once a student has agreed to work officially under the direction of a particular faculty member, and that faculty member has informed the Chair of the Graduate Program in writing of this mutual agreement, the student should ordinarily interact with the department through this faculty member. The student may always approach the Graduate Adviser directly upon his or her own initiative should any disagreements or issues arising from interpretations of Department, College or Graduate Studies regulations. Faculty who choose to accept students formally must adhere to all rules and regulations of the Department, College and Graduate Studies and are directly responsible to the Chair of the Program for their performance concerning student supervision. Regardless of whether a student has been accepted by a faculty member as an adviser, all forms required by the Graduate Studies Office must be signed by either Professor Orel or Jensen.

2. DEPARTMENT SEMINAR

All Graduate Program students must register for and participate in the departmental seminar, EAD 290, during their entire tenure. This course is graded S/U and depends entirely upon attendance. Second year and beyond students may attend seminars in other departments or formal seminar series at National Labs or other universities (approved by an advisor).

3. REQUIREMENTS FOR THE MS DEGREE

Requirements for the MS degree are:

I. Completion of 30 (MS I, thesis) or 36 (MS II, exams) quarter units of credit in graduate and upper division undergraduate courses, exclusive of courses 290 and 299, with a minimum GPA of 3.0. 12 of the 30 units (MS I) or 18 of the 36 units (MS II) must be at the graduate level.

II. Passing of the preliminary examinations **OR** presenting a thesis to be reviewed and approved by a three member committee. Membership of the committee shall consist of the research adviser who serves as chair and must be a member of ASGP. The two other members are selected by the chair of the committee. Only one member from outside the academic senate is allowed. One member of this committee should be outside the department if possible. The thesis committee must be approved by the Dean of Graduate Studies.

III. Three quarters of academic residence.

4. REQUIREMENTS FOR THE PhD DEGREE

Requirements for the PhD degree are:

I. Completion of 32 quarter units of credit in graduate and upper division undergraduate courses, exclusive of courses 290 and 299, with a minimum GPA of 3.5.

II. Passing of the preliminary examinations.

III. Approval of Program of Study

IV. Passing of the PhD oral qualifying exam

V. Advancement to Candidacy

VI. Approval of the PhD dissertation by PhD dissertation committee

VII. 6 quarters of academic residence

VIII. Dissertation Defense Seminar (Plan C)

5. OVERVIEW OF PHD STUDY

In order to fully appreciate the significance of the PhD degree granted by the University of California it is instructive to read what the Office of Graduate Studies says about the PhD degree:

"THE DOCTOR OF PHILOSOPHY DEGREE IS NOT GRANTED BY THE UNIVERSITY OF CALIFORNIA MERELY FOR THE FULFILLMENT OF TECHNICAL REQUIREMENTS, SUCH AS RESIDENCE OR COMPLETION OF FUNDAMENTAL COURSES. THE DOCTOR OF PHILOSOPHY DEGREE, AS GRANTED AT THE UNIVERSITY OF CALIFORNIA, MEANS THAT THE RECIPIENT POSSESSES KNOWLEDGE OF A BROAD FIELD OF LEARNING AND HAS GIVEN EVIDENCE OF DISTINGUISHED ATTAINMENT IN THAT FIELD; IT IS A WARRANT OF CRITICAL ABILITY AND POWERS OF IMAGINATION AND SYNTHESIS. IT MEANS, TOO, THAT THE CANDIDATE HAS PRESENTED A DISSERTATION CONTAINING AN ORIGINAL CONTRIBUTION TO THE KNOWLEDGE OF THE CHOSEN FIELD OF STUDY."

For a **typical PhD student** in Applied Science, the first year will be spend mainly on taking a set of **3 core course sequences.** These courses are supposed to cover the subject matter that forms the foundation of the student's desired area of expertise. Some of the subject matter covered in these core courses is tested in the **preliminary exams**. At the end of the first year, the student is expected to choose a **dissertation adviser,** although this may occur earlier (see 1). The dissertation adviser should be chosen for his/her expertise in the research area of interest to the student and after the first year the dissertation adviser should be the students' primary contact. The choice of the dissertation adviser must be formally approved by the Graduate Adviser. In consultation with the dissertation adviser the student should decide on which advanced courses to take in order to gain the necessary formal knowledge in his/her research area as well as to complete the course requirements. The resulting plan of courses should be submitted to the Graduate Adviser (**Program of Study**).

Typically year 2 and 3 of the PhD study will be spent on course work as well as research, whereas year 4 and 5 are spent mostly on research and writing of the dissertation. Before the end of the 3rd year the student must take the **PhD oral qualifying exam**. Upon passing this exam the student MUST select a dissertation committee and advance to candidacy. The final step for completion of the PhD is approval of the dissertation by the committee.

6. CORE COURSES AND PRELIM EXAM AREAS

All core courses are taught on the Davis campus.

AN INCOMING STUDENT HAS TO DECIDE WHICH COURSES TO TAKE IN THEIR FIRST YEAR AS WELL AS WHAT SUBJECT AREAS HE/SHE WANTS TO BE EXAMINED IN FOR THE PRELIM EXAM. COURSES AND EXAM AREAS SHOULD MATCH THE STUDENTS' GENERAL RESEARCH INTEREST AND THEIR CHOICE SHOULD BE MADE IN CONSULTATION WITH THE GRADUATE ADVISER OR DISSERTATION ADVISER (IN CASES WHERE THE STUDENT ALREADY KNOWS WHO THE DISSERTATION ADVISER IS). IN MOST CASES THE STUDENT WILL CHOOSE OVERLAPPING COURSES AND EXAM AREAS.

IN THE GRADUATE PROGRAM IN APPLIED SCIENCE, A WIDE RANGE OF RESEARCH AREAS IS COVERED, INCLUDING LASER PHYSICS, PLASMA SCIENCE, ATOMIC AND MOLECULAR PHYSICS, COMPUTATIONAL PHYSICS, MILLIMETER AND MICROWAVE TECHNOLOGY, AND MEDICAL TECHNOLOGY. SOME OF THESE AREAS, FOR EXAMPLE LASER PHYSICS AND PLASMA PHYSICS, SHARE A COMMON FOUNDATION AND THEREFORE THEY CAN BE CONSIDERED AS DIFFERENT BRANCHES COMING FROM THE SAME STEM.

Some of the various areas of emphasis in Applied Science and their typical core subject areas are:

I. LASER PHYSICS / PLASMA PHYSICS
- Mathematical Physics
- E&M
- QUANTUM MECHANICS

II. COMPUTATIONAL SCIENCE
- Mathematical Physics
- Numerical Methods
- E&M or
- Quantum Mechanics or
- Applied Bioscience

III. BIOMEDICAL TECHNOLOGY
- Mathematical Physics
- E&M or
- Quantum Mechanics
- Applied Bioscience

See Table 1 for typical course schedules.

Table 1 shows a listing of the various core subject areas and their corresponding course schedule.

TABLE 1. CORE COURSES AND PRELIM EXAM AREAS

	FALL	WINTER	SPRING
Mathematical Physics	EAD 205A, 205C Math Phys	EAD 205B Math Phys	
Numerical Methods		EAD 210A Num Meth	EAD 210B Num Meth
Quantum Mechanics		EAD 231A QM	EAD 231B QM
Electricity & Magnetism		EAD 234A E&M	EAD 234B E&M
Applied Bioscience	BIS 102 Biomolec and/or Org. Chemistry (dependent on background)	BIS 102 if not taken during the Fall	BIS 103 Biomolec or BIS 104

These courses have been divided into two categories:

Category A

MATHEMATICAL METHODS OF PHYSICS

Category B

ELECTRICITY AND MAGNETISM
QUANTUM MECHANICS
NUMERICAL METHODS
APPLIED BIOSCIENCE

The remainder of coursework needed to fulfill degree requirements can be taken in the second or third year. Coursework for each student may vary and will be chosen in conjunction with the dissertation advisor.

7. PRELIMINARY EXAMINATION

Preliminary examinations must be passed for the MS(II) as well as for the PhD degree. For the PhD, the exams must to be passed at a higher level than for the MS degree. Currently, the math exam is given at the beginning of Spring Quarter and the other exams are given at the end of Spring Quarter. Students are required to take these exams before the end of their first year. Under exceptional circumstances, the exam can be postponed or taken only in part. To request such an exception to policy, the student MUST consult with their dissertation adviser (if applicable) and the Graduate Adviser. The student must present in writing a request for the exception, the reasons for the exception, and an academic plan showing how and when the student will take the exams. This plan will be presented to the Chair of the Graduate Program in Applied Science for consideration. In all cases, the exam must be taken for the first time before the fall of the 3rd year.

Only two attempts are permitted. If the student does not pass the exam, it must be taken again at the first opportunity. If they do not do so, a fail will be recorded.

All students are required to take the exam in the area of Mathematical Physics. This is a written exam. Each student then has to choose 2 additional subject areas for examination. These two exams will be oral exams from the category B subjects. Certain areas of emphasis require certain exams. Students are strongly encouraged to consult with the Graduate Adviser (and, if appropriate, their formal faculty supervisor) who will direct them to the chair of the area of emphasis.

For each exam area the corresponding subject matter is covered in the courses listed in Table 1. For example, the required material for the exam in Math Phys is covered in EAD205ABC. For Num Meth the corresponding exam material is covered in EAD 210AB. Students pass the prelim exam by subject area. So it is possible that a particular student only passes in 2 out of 3 subjects. **This means at the next exam they have to retake only the subject they did not pass. They could opt for a new 3rd subject but in that case will be only given one chance for the exam in that subject.**

8. PROGRAM OF STUDY

In the first quarter after 24 units of coursework is completed and the Preliminary Examination attempted, the student is required to file a program of study for approval. The program of study should be filed far in advance of the actual completion of coursework. The program is prepared by the student in consultation with the dissertation adviser, the Graduate Adviser, and one other faculty member. It provides a guide for planning by the student. The program can be changed for good cause.

A *minimum* PhD program, exclusive of courses 290 and 299, is 32 quarter units. These courses must represent a coherent program of study towards the PhD. Students should consult with their dissertation adviser and Graduate Adviser about their individual programs of study. No course taken under the P/NP or S/U option may be included in the program of study.

Occasionally, the PhD Oral Examination Committee requires additional course work.

This total program includes the courses taken in the MS program. At least 24 units must be earned at UC Davis. All other course work may consist of credits transferred from graduate programs in other approved institutions.

8.1 GENERAL COMMENTS

<u>The core courses, or their equivalent, must be taken for a grade.</u> At least 18 of the 36 units required for the MS II degree and 12 of the 30 units for the MS I degree must be in graduate courses. No more than one course taken under the P/NP or S/U pass option may be included in the 36 units required for an MS degree. A maximum of 6 units of course work beyond the bachelor's degree taken at another institution may be transferred for credit. Credits obtained as an undergraduate cannot be applied to the unit requirement for the MS or PhD degree. Full-time students must register for and participate in the departmental seminar, EAD 290, during their entire tenure as full-time students. Students holding a master's degree may request a transfer of up to 18 quarter unit of coursework to be counted toward the PhD coursework requirement.

9. PH.D. ORAL QUALIFYING EXAMINATION

The PhD Oral Qualifying Examination must be taken before the end of the 3rd academic year and after completion of all required course work toward the PhD. These units include any units transferred from other institutions. For a typical student, who takes the prelim exam in the fall of the 2nd year, the PhD oral qualifying exam MUST be taken before the end of the 3rd year.

Students failing to maintain a minimum of a 3.5 GPA will not be allowed to take the oral qualifying exam, because this is a Graduate Program requirement for advancement to candidacy. In the absence of compelling reasons clearly justifying a further extension of the time (and approved by the Graduate Adviser), failure to take the PhD oral examination within the required period will necessitate retaking the written preliminary examination or being dismissed from the program.

It should be clearly understood that the purpose of the PhD Oral Qualifying Examination is to ascertain that the student is prepared to begin their dissertation research work. Thus, it is not necessary to know all the details of a proposed dissertation area. However, the general nature of the dissertation research area should be known and some preliminary study should have been carried out in that area.

In consultation with their advisers, students should select five members required to serve on the PhD Oral Qualifying Examination committee. One member of the committee must be from one of the science departments (e.g., physics, chemistry, geology, biology, mathematics) outside the College of Engineering. A second member must be from a department within the College of Engineering exclusive of Applied Science. The proposed dissertation adviser can be a member of the PhD Oral Qualifying Examination committee but cannot be the chair. A research advisor from any of the participating National Labs (e.g., LLNL) **CANNOT** be a member. The chair of the committee shall be an active academic senate faculty member of the Graduate Program. Only one non-Senate member may serve on the committee.

An adjunct faculty member can serve as a dissertation adviser. Because adjunct faculty are not members of the academic senate and if included as a member, the other four must be academic senate members.

NOTE: This committee MUST be approved by the Graduate Program and the

Graduate Studies Office. This process can take some time. This paperwork MUST be filed well in advance of the oral exam.

Although the committee members may ask questions on a wide range of subjects, covering all the core courses, they will generally emphasize the subjects suggested for examination.

The list of suggested subjects for examination comes from consultation between student and advisers and is included on the student's Application for Qualifying Examinations. The suggested subjects can be quite general. However, it is better to be somewhat specific. The usual procedure is to select one specialized topic that encompasses the proposed area of the dissertation research, a second broader area that includes the first, and a third distinct area. An example, by a student who proposed to do research on the heat capacity of metals, is: 1) heat capacity of solids; 2) solid-state physics; 3) quantum mechanics.

NOTE: Upon successful completion of the oral exam, the student must obtain the signature of the chair of their orals committee on the advancement to candidacy form. Failure to do so can result in delays in the student's advancement to candidacy.

10. DESIGNATED EMPHASIS IN BIOPHOTONICS

Students with dissertation topics in the area of biophotonics may wish to add a designated emphasis in Biophotonics. Students who fulfill the requirements for this program will receive PhDs with a designated emphasis in Biophotonics. Specific requirements for this area should be in consultation with Professor Yin Yeh.

11. PH.D. DISSERTATION COMMITTEE

Upon successful completion of the PhD Oral Qualifying Examination, a dissertation committee is established and the student then advances to candidacy. Three or more members comprise the dissertation committee: (1) the dissertation committee chair (or major professor), who must be a member of the Graduate Program. (2) an outside member, who is not a member of the Graduate Program. The outside member may be a faculty member from elsewhere at UC Davis, a faculty member from another academic institution, or a scientist from a National Laboratory. Note that if this member is not a UC Davis faculty member then special steps must be taken for Graduate Studies to approve the committee. In particular, an "External Committee Membership Application" form must be completed and approved. Faculty who hold joint appointments in the Graduate Program and other programs at UC Davis will not be considered as outside members. (3) The third member may be any member of the graduate program. If the Dissertation Committee Chair is not a member of the Academic Senate, then this third member must be an Academic Senate member of the Graduate Program.

In some cases, the committee has four members. In that case, the fourth member may be any faculty member from the Graduate Program, or another outside member as described in (2). However, normally at most one member is allowed who is not a voting member of the UC Academic Senate or member of the Graduate Program.

Committee members are identified by PhD students in consultation with their major professor. It is important that candidate members be contacted to determine their willingness and availability to serve. The composition of the dissertation committee is subject to review and approval by the Graduate Adviser. The committee has the primary responsibiliy of reviewing and approving the PhD dissertation and is formally appointed by the Dean of Graduate Studies on behalf of the Graduate Council.

12. TIME TO DEGREE POLICY

Students will have 4 calendar years after the date they pass their qualifying exam to submit their dissertation. At this time, if a student has not submtted their dissertation to Graduate Studies, the student will receive a notice from Graduate Studies that they are placed on probation, and has 1 year from that date to submit the dissertation. If not submitted within 1 year, the student will no longer be allowed to enroll the following quarter and will be disqualified.

The clock is "set" from the date of passage of the Qualifying Exam, NOT the time the student officially advances to candidacy through submission of the form to Graduate Studies. This prevents a student from delaying submission of the form to Graduate Studies when they have in de facto "advanced."

After disqualification, a student will have to be readmitted to the program through the programs' admission process to receive their PhD. If programs are willing to re-admit the student, the student will be required to retake the qualifying exam to demonstrate that their knowledge of the research area is current.

Major professor, academic advisers, or student may petition Graduate Council for an exception to this policy for cause. In addition, a dissertation committee may petition for an exception to retaking the qualifying exam. Students, faculty and programs have the right to appeal the denial of the exceptions to policy for cause.

This is a generous timeline given that normative time for programs on campus is typically 5-6 years. Thus, if a student passes the qualifying exam during the 3rd year (before the 9th quarter), this requirement gives the student an additional 4 years to complete their dissertation work and remain in good academic standing. This would represent submission of the dissertation in the 7th year of registration. In addition, a student has a probationary year beyond that for completion. This represents 8 years total, which is well beyond the normative time for programs on this campus.

13. FILING FEE

The Filing Fee is a reduced fee paid in lieu of Registration Fees. You are eligible for Filing Fee Status when you have advanced to candidacy and completed all requirements for your degree except filing your thesis or dissertation and your dissertation defense. The completion of formal course work or residency requirements does not entitle you automatically to apply for Filing Fee Status. While on Filing Fee Status you may not be using any University facilities (health center, housing, library, etc.), using faculty time other than that involved in the final reading of your thesis/dissertation or in holding final examinations, holding any academic student title, receiving a fellowship or financial aid, or taking course work of any kind.

In compliance with the guidelines of the College of Engineering, students can only go on Filing Fee after a rough draft of the thesis/dissertation has been read by all thesis/dissertation committee members and have filled out the required form from the college, complete with the signatures of their committee. Usually, a student may be on Filing Fee for only one quarter.

14. PhD DISSERTATION DEFENSE

Upon completion of the dissertation work, each PhD student **MUST** present a dissertation defense consisting of a formal seminar (open to anyone) summarizing and defending the results. A closed oral exam with their PhD committee will follow the seminar (Plan C).

15. OPEN CAMPUS PROGRAM

With prior approval of the Graduate Adviser, courses from the Open Campus Program (formerly University Extension or concurrent Classes program) may be used as evidence of suitability for admission, or to 'sample' the graduate program before formal enrollment. A *maximum* of 12 units taken in the Open Campus Program may be transferred for graduate credit.
For more information on the Open Campus Program check the following:

www.universityextension.ucdavis.edu

STUDENTS WISHING ADMISSION TO THE PROGRAM WILL ONLY BE ALLOWED TO TAKE COURSES WITH CONCURRENT STATUS FOR ONE YEAR OR A TOTAL OF 18 UNITS, WHICHEVER AMOUNTS TO THE LESSER TIME DURATION.

APPENDIX A: GRADUATE PROGRAM MEMBERS

Academic Senate Members

Berni Alder	Emeritus
Hector Baldis	Vice Chair
Thomas Cahill	Emeritus
Richard Christensen	Emeritus
Paul Craig	Emeritus
Stephen Cramer	
Yong Duan	
John DeGroot	Emeritus
Richard Freeman	Emeritus
Francois Gygi	
Walter Harris	
Jonathan Heritage	Emeritus
William Hoover	Emeritus
David Hwang	
Niels Jensen	
Brian Kolner	
Denise Krol	
Neville Luhmann	
Nelson Max	Computer Science
Gregory Miller	
William McCurdy	
Ann Orel	Chair
Atul Parikh	
Richard Post	Emeritus
David Rocke	
Garry Rodrigue	Emeritus
Rao Vemuri	
David Woodruff	Grad School of Management
Yin Yeh	

Adjunct Faculty Members

Rod Balhorn
Andrew Canning
Jim Felton
William Kruer

Other Members

Steve Cliff
Thomas Huser
Dennis Matthews