

**University of California, Merced**

**Graduate Group in Quantitative and  
Systems Biology**

**Policies and Procedures**

**2005–2006**

## **I. SCOPE OF RESEARCH**

The life sciences are undergoing a vast and fundamental metamorphosis from a discipline based on qualitative observation and description, into a quantitative science based on comprehensive datasets and predictive models. The Quantitative and Systems Biology Graduate Group at UC Merced offers a multidisciplinary research and training program for masters degree and doctoral students who want to be at the forefront of this revolution the biological sciences. Research projects are available on topics ranging from intercellular signaling to computational molecular biology, and coursework will provide a background in the tools of modern biology, including computational biology, genomics and advanced instrumentation. The graduate group will offer opportunities for students interested in multidisciplinary projects at the interface between biology, computer science, and bioengineering.

## **II. GRADUATE ADMISSIONS**

All persons seeking admission to graduate standing must make formal application for admission. We encourage applicants to utilize the on-line application to streamline the process. Applications are reviewed by the Admissions Committee, which makes recommendations on admission to Graduate Studies; the Dean of Graduate Studies makes final decisions on admission.

### **II. A. APPLICATION DEADLINES FOR ADMISSION**

The deadline for receipt of applications is January 15. Normally applications will be accepted for Fall semester only, enrollment in other semesters will be considered on an individual basis, with applications due no later than seven months prior to the beginning of the semester when the student would like to begin graduate studies. Applicants are encouraged to contact individual faculty members to discuss their research interests before applying for graduate study.

### **II.B. MATERIALS TO BE SUBMITTED**

- \* The complete official application form;
- \* The application fee;
- \* All official university/college/junior college transcripts;
- \* An official Graduate Record Exam (GRE) score report. Only the general tests are required;
- \* Three letters of recommendation from instructors or supervisors who can comment on the applicant's scholarly ability and promise as a researcher;
- \* Official score reports from the Test of English as a Foreign Language (TOEFL) and the Test of Spoken English (TSE) if the applicant's native language or language of instruction is other than English.

Applicants are encouraged to contact individual faculty members to discuss their research interests before submitting a full application.

### **II.C. ADMISSION CRITERIA**

The minimum requirement for graduate admission to UCM is a bachelor's degree with an undergraduate grade point average no lower than 3.0 on a 4.0 scale. This minimum will be waived only under circumstances where the applicant has demonstrated strong academic skills subsequent to their undergraduate studies. Performance on the GRE, accomplishments in undergraduate research, and letters of recommendation are also important determinants of an applicant's potential for success in graduate education and will be evaluated by the admissions committee. Foreign students from non-English speaking countries are required to attain a minimum score of 580 on the TOEFL exam (paper version) or 230 (computer-based version), as well as a score of at least 45 on the TSE. Each academically qualified student will also have a telephone or in-person interview with one or more QSB faculty members. Finally, the match of the candidate's skills and interests to QSB research programs will be

considered. For this reason applicants are encouraged to contact QSB faculty before applying.

### **III. GENERAL REQUIREMENTS FOR ADVANCED DEGREES**

#### **III.A. RESIDENCY**

In accordance with SR 682 and 686, the minimum residency requirement for any advanced degree is two semesters. The minimum residency requirement for the Ph.D. degree is four semesters. Before advancement to candidacy Ph.D. students must be registered in regular University courses as a full-time student for at least two semesters. M.S. students must be registered as a full-time student for at least one semester before advancement to candidacy. M.S. students must be in residency for at least one semester after advancement to candidacy before conferral of the degree. For the purposes of determining residency, only the Fall and Spring semester will be counted; however, the summer semester may be counted in evaluating students on academic probation. Residency is established by satisfactory completion of at least 12 units of graduate coursework (including research) per term. Ordinarily, a graduate student shall not receive credit for more than 12 units of graduate courses in any semester. The QSB graduate group only accepts full time students. Exceptions will only be granted for students in the non-thesis Masters Degree program (Section V.B.) with the permission of the graduate group Chair, in consultation with the Executive Committee.

#### **III.B. SCHOLARSHIP**

Graduate students must maintain at least a 3.0 grade-point average to be considered in good academic standing or to be awarded an academic graduate degree. A student whose cumulative graduate grade-point average falls below 3.0, or who is judged not to be making satisfactory progress toward the degree by his or her graduate advisor or faculty committee, will be placed on academic probation. The student will then be allowed a maximum of one semester to make up the deficiencies and be returned to good academic standing (beyond the semester they go on probation). Otherwise, the student will be dismissed from the graduate program.

Specific scholarship requirements are as follows:

1. Only courses in the 100 and 200 series in which the student receives grades of "A", "B", or "S" may be counted in satisfaction of the requirements for advanced degrees. A course in which a student receives a "C" or "D" or lower cannot be used to satisfy the unit requirement for the degree but will count in determining the grade point average.
2. Candidates must maintain an average of at least three grade points per unit in all upper division and graduate courses elected during their residence as graduate students at the University of California. Students must maintain an average grade point of 3.0 for advancement to candidacy and conferral of the degree.
3. Courses graded "S/U" will not be counted in determining grade point averages.
4. Students must make satisfactory progress on their programs of study as determined by their graduate research advisor.

#### **III.C. FACULTY COMMITTEES FOR ADVANCED DEGREES**

All students in the QSB graduate group must have a graduate research advisor and committee. The student's graduate research advisor (see section IV.C.), normally in consultation with the student, the graduate group and other faculty, recommends appointment of faculty members to advise on and supervise the student's dissertation research, serve on examination committees, and review and pass upon the merits of the doctoral dissertation. Final approval of the membership on these committees rests with the Dean of Graduate Studies.

Advanced degree committees in the Quantitative and Systems Biology group typically consist of three members, although additional committee members are permitted if warranted by the student's research project. One is the student's graduate research advisor and the two or more others are UC Merced faculty members in the group (one of whom is appointed as Committee Chair). Under some circumstances one of the committee members can be a UC Merced faculty member from outside the group or a regular or adjunct faculty member from any UC campus or an individual from outside the University of California who has special expertise and qualifications. In this case, the graduate research advisor should submit a brief statement indicating the appointee's affiliation and title and how the prospective appointee has special expertise or qualifications that are not represented on the campus. In addition to the justification letter from the graduate advisor, a curriculum vita and a letter from the proposed appointee indicating a willingness to serve must be submitted to the Chair of the Quantitative and Systems Biology graduate group for review and approval by the Executive Committee.

All members of the committee must be in attendance for Ph.D. qualifying examinations and thesis defense. If a committee member's absence from campus for an extended period of time makes scheduling of examinations unreasonably difficult, the student may request that the committee be reconstituted. Reconstitution of the committee may also be justified by a substantial change in the student's thesis topic or may be required by the departure of a committee member from the university. When membership changes must be made, the graduate advisor in consultation with the student should recommend a new committee member, giving the reason for the change. The change must be approved by the Chair of the Quantitative and Systems Biology graduate group with consultation from the Executive Committee.

## **IV. DOCTORAL DEGREE**

### **IV.A. SIGNIFICANCE**

The Doctor of Philosophy degree is granted to students who demonstrate a thorough knowledge of a broad field of learning and have given evidence of distinguished accomplishment in that field. The degree also signifies that the recipient has critical ability and powers of imaginative synthesis as demonstrated by a doctoral dissertation containing an original contribution to knowledge in his or her chosen field of study.

### **IV.B. REQUIREMENTS**

The Quantitative and Systems Biology graduate group has established the following requirements for the Ph.D. degree. Students must:

- Complete at least four semesters of full-time academic residence (12 units minimum) at UC Merced;
- Earn a passing grade in at least four graduate courses of at least three units (exclusive of research) (see section IV.D);
- Complete all graduate courses with a letter grade of at least "B";
- Serve as a Graduate Student Instructor (GSI) for at least one semester;
- Pass a qualifying oral exam (see section IV.F.);
- Present an open technical seminar at least twice while in residence; (see section IV.H)
- Publish at least one scientific paper in the peer-reviewed literature (see section IV.I.);
- Present and successfully defend a doctoral dissertation containing an original contribution to knowledge in the field. (see section IV.J.)

### **IV.C. SELECTION OF A GRADUATE RESEARCH ADVISOR**

The heart of the Quantitative and Systems Biology Ph.D. program is the completion of a piece of original scientific research leading to the preparation and defense of a Ph.D. thesis. To this end, each student should discuss research interests and possible Ph.D. projects with all of the faculty in the group as early as possible, and select a graduate research advisor early during the first year of study. Selection of a graduate research advisor must be approved by the graduate group and must occur before the student's faculty committee can be constituted. The student and the graduate research advisor together will develop a research topic, and research will normally occupy a majority of the student's time after the first year of residence. Interdisciplinary projects are highly encouraged, as are research collaborations with faculty or senior scientists outside UC Merced. However, the graduate research advisor must be a member of the Quantitative and Systems Biology group. Students will be assigned an initial advisor when they first enroll, unless the student has already chosen an advisor.

### **IV.D. COURSEWORK REQUIREMENTS**

All graduate students in the Quantitative and Systems Biology group are required to take a two semester course, Current Topics in Quantitative and Systems Biology (QSB 290) that exposes them to current, cutting-edge research directions in the field. This is a 3-unit per semester course consisting of three hours of discussion per week and significant out-of-class reading and study. The course format emphasizes student-led presentation, analysis, and discussion of reading assignments from the current and recent scientific literature.

All students in the group must also successfully complete (grade of B or better) at least two additional graduate courses (courses numbered 200-299 and worth at least three units each) exclusive of research (QSB 295) that are appropriate to the student's research area. Suggested courses include Bioinformatics and Computational Biology, Biophysics and Proteomics Laboratory, Genomic Biology, Cell Signaling and Networks, Developmental Biology, and Immunology. Other graduate-level courses appropriate to the

student's specific field of research, including Directed Independent Study (QSB299) may be used to meet the two-course minimum requirement with consent of the student's faculty committee. Normally these courses should be taken during the first year of graduate study. Requirements for formal course work beyond the minimum are flexible and are determined by the individual student's background and research topic in consultation with the student's graduate research advisor.

#### **IV.E. RESEARCH PROPOSAL**

Before the qualifying exam, the student will provide to the degree committee a written document (typically five to ten pages) that describes his or her research topic, summarizes progress to date, and outlines what he or she proposes to do, why it is relevant, and what will be learned. The committee will review this document with the student and determine if the student has outlined a project that is appropriate for a Ph.D. If not, the student is given a month to rewrite the research plan. Once the research plan is approved the student may take the oral portion of the Qualifying Examination.

#### **IV.F. PH.D. QUALIFYING EXAMINATION**

All students in the Quantitative and Systems Biology Ph.D. program are required to pass a qualifying examination before advancement to candidacy for the Ph.D. degree. Students are expected to take and pass the qualifying examination during their second year of graduate study unless they successfully petition the graduate group chair to take it at a specific later date. Students entering the Ph.D. program with a M.S. degree may request to take their qualifying exam during their first year, provided their graduate research committee approves. The examination committee is the same as the student's faculty committee except that the graduate research advisor is replaced by another member of the group, selected by the chair of the graduate group in consultation with other members. The members of each student's examination committee will select one member to chair the examination committee. The dates for the examination are arranged between the student, their graduate research advisor, and the examination committee chair.

The qualifying exam may be taken only after the student's written research proposal has been approved by the student's committee (Section IV.E.). The exam will focus on the student's research proposal, but may cover any related field of science, and will typically last three hours. The committee conducts the examination, and immediately thereafter submits the results of the examination to Graduate Studies. Possible outcomes are:

1. Pass (conditions may not be appended to a pass decision)
2. Not passed, with an option to retake the examination within a specified time period, or to satisfy specific other requirements
3. Fail

The committee members should include in their evaluations of the student such factors as relevant portions of the previous academic record, performance on the examination, and an overall evaluation of the student's performance and potential for scholarly research as indicated during the examination. The committee should strive to reach a unanimous decision. If a unanimous decision is reached, the committee shall inform the student of its decision in one of the forms listed above. If the decision is "Not Pass" or "Fail", the chairperson of the committee must include in a report a specific statement, which may include a minority report, explaining its decision and must inform the student of its decision. In the case of a "Not Pass" decision, the committee must include in its report a further statement of its terms and inform the student of those terms. In those cases when it is not possible for the members to resolve their differences, the student should be informed of the nature of those differences and each member should submit a detailed assessment of the student's performance to the Chair of the graduate group.

The Chair, in consultation with other members of the graduate group, will use these individual reports to adjudicate the result.

Upon recommendation of the examination committee, a student who has not passed the examination may repeat the qualifying examination after a preparation time of no more than six months. The examination must be held by the same committee except that members may be replaced, with the approval of the graduate advisor, for cause such as extended absence from the campus. Failure to pass the examination on the second attempt means that the student is subject to disqualification from further study for the doctoral degree. After a second examination, a vote of NOT PASS is unacceptable; only PASS or FAIL is recognized by the Dean of Graduate Studies.

#### **IV.G. ADVANCEMENT TO CANDIDACY**

Upon successful completion of the examinations and approval of a research plan, the student is given an application for advancement to candidacy by the examining committee chair. When it is filled out and signed by the graduate research, the student pays a candidacy fee and submits the form to Graduate Studies. Upon advancement to candidacy for the degree, the faculty committee is then charged to guide the student in research and in the preparation of the dissertation.

#### **IV.H. SEMINARS**

All students in the Quantitative and Systems Biology group are required to present an open technical seminar at least twice during their residence in the graduate group. The topic of the seminar may be the student's own research or it may be any other topic that falls within the areas of study spanned by the group, broadly defined. The seminar may be presented as part of a regular seminar series or, if necessary, as a special seminar. The open presentation given as part of the Ph.D. defense may be counted as one of the required seminars.

#### **IV.I. PUBLICATION REQUIREMENT**

The final confirmation of the quality of a PhD dissertation is the ability to publish the research results in a peer-reviewed journal. The research field may influence the timing and work required to publish research results, making it difficult to define the number of publications required for each dissertation. For this reason, whether a student has made sufficient progress for the PhD will ultimately be determined by the student's advisor and thesis committee. However, it is expected that the research project should be sufficiently complete to support publication of at least one full manuscript. The QSB Executive Committee may determine if having simply submitted a manuscript is sufficient to warrant completion of the PhD requirements, although in most cases, acceptance of the manuscript by the journal will be expected (i.e. manuscript "in press" or "in print").

The publication requirement should encourage the student to view submission of manuscripts as the ultimate goal of any research project, and to teach the student how to organize research projects and write scientific manuscripts. The process of writing the manuscript will be undertaken with the assistance and guidance of the student's research adviser. Manuscripts should be presented to the graduate committee for examination and approval at the time of the student's thesis defense.

#### **IV.J. DISSERTATION AND FINAL EXAMINATION**

The Ph.D. dissertation must be creative and independent work that can stand the test of peer review. The expectation is that the material will serve as the basis for publication(s) in a peer-reviewed journal. The work must be the student's, and it must be original and defensible. The student is encouraged to discuss with members of the faculty committee both the substance and the preparation of the dissertation well in advance of the planned defense date. Detailed instructions on the form of the dissertation and abstract may be obtained from the Graduate Studies office.



The student must provide a copy of the dissertation to each member of the faculty committee and allow each committee member at least four weeks to read and comment on it. If one or more committee members believe that there are significant errors or shortcomings in the dissertation or that the scope or nature of the work are not adequate, the student must address these shortcomings before scheduling a defense. Once the committee members are in agreement that the dissertation is ready to be defended (although minor errors or matters of controversy may still exist), the final examination date may be scheduled by the student in consultation with the committee. The date must be reported to the Dean of Graduate Studies, and one copy of the dissertation filed, no later than three weeks before the proposed date of the final examination.

The Ph.D. final examination consists of an open seminar on the dissertation work followed by a closed examination by the faculty committee. During the examination, the student is expected to explain the significance of the dissertation research, justify the methods employed, and defend the conclusions reached. At the conclusion of the examination, the committee shall vote on whether both the written dissertation and the student's performance on the exam are of satisfactory quality to earn a University of California Ph.D. degree. A simple majority is required for a pass. Members of the committee may vote to make passing the exam contingent on corrections and/or revisions to the dissertation. In this case, the committee will select one member, normally the graduate research advisor, who will be responsible for approving the final version of the dissertation that is submitted to Graduate Studies. All members of the degree committee must sign the final dissertation.

## **V. MASTER'S DEGREE**

### **V.A. SIGNIFICANCE**

Students may be admitted to the graduate program in Quantitative and Systems Biology to work towards a Masters Degree (M.S.). Additionally, a Ph.D. student who has been in residence for at least two semesters, is in good academic standing, and has completed at least three of the core courses may petition the Admissions Committee to pursue a terminal M.S. degree. The recipient of a M.S. degree is understood to possess knowledge of a broad field of learning that extends well beyond that attained at the undergraduate level, but is not necessarily expected to have made a significant original contribution to knowledge in that field.

### **V.B. REQUIREMENTS**

The Quantitative and Systems Biology group has established the following requirements for the M.S. degree. Each M.S. student has a committee with at least three members (see description for Doctoral committees above), and students writing a masters thesis have a graduate research advisor. Two different tracks are recognized:

#### **PLAN I**

- Complete at least two semesters of full-time academic residence (12 units minimum) at UC Merced;
- Complete at least three of the group's graduate courses with a letter grade of at least "B";
- Complete at least 20 semester hours of upper-division and graduate course work with a cumulative grade-point average of at least 3.0. At least 12 semester hours must be from regular, letter-graded lecture courses (including the core courses), while the remaining 8 hours may be research or similar courses;
  - Prepare an acceptable thesis describing original research in the field and successfully defend thesis to thesis committee.

#### **PLAN II**

- Complete at least two semesters of full-time academic residence (12 units minimum) at UC Merced;
- Complete at least four of the group's graduate courses with a letter grade of at least "B";
- Complete at least 24 semester hours of upper-division and graduate course work with a cumulative grade-point average of at least 3.0. At least 16 semester hours must be from regular, letter-graded lecture courses (including the core courses), while the remaining 8 hours may be research or similar courses;
  - Pass a comprehensive qualifying oral examination administered by the faculty committee. This examination will test the student's understanding of the main concepts in the field at the graduate level.

### **V.C. COMBINED B.S./M.S. IN BIOLOGICAL SCIENCES**

The Quantitative and Systems Biology Graduate Group offers undergraduate students in the UC Merced Biological Sciences and Human Biology degree programs the opportunity to continue study beyond their bachelor's degree to achieve a M.S. degree. This degree requires at least two additional semesters of full-time academic residence at UC Merced beyond completion of all requirements for the B.S. degree. Students accepted for the combined B.S./M.S. degree may begin taking graduate courses and research as soon as they are admitted into the program. Candidates for the combined degree program should submit an application to the Dean of Natural Sciences and the Dean for Graduate Affairs. Students may begin joint B.S./M.S. studies in either the Fall or Spring Semester. The application deadline is January 5 for the Fall semester and July 1 for the Spring semester. Candidates for the combined B.S./M.S. program may choose either Plan I or Plan II described above.

## **VI. TIME TO DEGREE AND ANNUAL EVALUATION OF GRADUATE STUDENT PROGRESS**

The Quantitative and Systems Biology Graduate Group places a nominal time limit of two years from entrance to completion of the M.S. and five years for completion of the Ph.D. Extensions beyond these limits can be permitted by the Chair of the Quantitative and Systems Biology Graduate Group in consultation with the Executive Committee. Ph.D. students entering with a M.S. Degree have a nominal time limit of four years.

In order to ensure satisfactory progress toward the degree, each student must meet with his or her faculty committee for an annual review of progress at a mutually agreeable time prior to the first day of each Fall semester. (For Ph.D. students these meetings occur each year after advancing to candidacy.) At least two members of the committee must be present. The committee will review the student's progress toward the degree during the past year and develop a time table, mutually agreeable among student, graduate research advisor, and faculty committee, for completion of the remaining requirements. The annual report of the committee will become part of the student's record.

Should the committee conclude that the student is not making satisfactory progress toward the degree, the student may be placed on academic probation as described under "Scholarship" above (Section III.B.)

## VII. TEACHING AND RESEARCH ASSISTANTSHIPS AND STIPENDS

Graduate students in the Quantitative and Systems Biology group are normally offered stipend support in the form of either Graduate Student Instructor positions (GSIs) or Research Assistantships (RAs). Students in their first semester of residence usually serve as GSIs for appropriate courses in the schools of Natural Sciences or Engineering. After the first semester, support may be offered through either a funding as a GSI or an RA in the graduate research advisor's laboratory. GSI stipends are set by the schools while RA stipends are determined by the Graduate Group. Graduate students with external fellowships are still required to satisfy the one semester teaching requirement and will be paid by the school for teaching.

While every effort will be made to provide employment as a GSI or RA for all graduate students in residence, admission to graduate study carries no guarantee of financial support. Financial support for Masters Degree students will be addressed on a case-by-case basis.