Commented [BC1]: Modification date in header updated by Brittany Conn on 2018-03-20 to reflect accurate modification date.

University of California, Merced

Graduate Group in Biological Engineering and Small-scale Technologies

Policies and Procedures

2017-2018

I. SCOPE OF RESEARCH

The engineering sciences are undergoing a vast and fundamental metamorphosis from isolated disciplines to more integrative and multidisciplinary topics. The Biological Engineering and Small-scale Technologies (BEST) 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 in biologics engineering and nanotechnology. Research projects are available on topics ranging from fundamental characterization of materials to tissue engineering, and coursework will provide a background in the tools of biologics and integration of modern materials. The graduate group will offer opportunities for students interested in multidisciplinary projects at the interface between biological engineering, nanotechnology, bioelectrical engineering, mechanical engineering, computer science, and materials characterization and design.

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 Spring semester 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;

Note: BEST graduate program will waive the GRE exam requirement for UC, Merced undergraduate students applying for the M.S. degree.

* 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:

1. **TOEFL or IELTS Scores:** All graduate applicants -- regardless of citizenship -- whose preparatory education was principally in a language other than English, must show evidence of having recently taken the Test of English as a Foreign Language (TOEFL) **or** the International English Language Testing Service (IELTS) examination. Please note that TOEFL and IELTS scores expire two years after the test date. The minimum requirements are as follows:
    - TOEFL: 550 on the paper test or 80 on the TOEFL iBT (internet-Based Testing)
    - IELTS: a score of at least 7

2. UC Merced's TOEFL iBT score requirements for admission consideration is an overall minimum score of 80. The minimum scores on each section are as follows:
    - 19 / Writing
    - 26 / Speaking (see * below)
    - 17 / Listening
    - 18 / Reading

*NOTE: International and U.S. Permanent Resident graduate students who are not citizens of countries where English is either the primary or dominant language MUST pass an approved oral English-proficiency examination to be considered for appointment as a Teaching Assistant or Teaching Associate. There is NO EXCEPTION to this requirement.

Academically qualified students may also be required to complete a telephone or in-person interview with one or more of the BEST faculty members. Finally, the match of the candidate's skills and interests to BEST research programs will be considered. For this reason applicants are encouraged to contact BEST 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 BEST 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 "B-", 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 BEST 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 Biological Engineering and Small-scale Technologies 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 Biological Engineering and Small-scale Technologies 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 reviewed and approved by the Chair and Graduate Dean.

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 Biological Engineering and Small-scale Technologies 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 five graduate courses of three-four units each (exclusive of research) (see section IV.D);
- Complete all graduate courses with a letter grade of at least "B";
- Serve as a Teaching Assistant (TA) 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 Biological Engineering and Small-scale Technologies 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 Biological Engineering and Small-scale Technologies group. Students will be assigned an initial advisor when they first enroll, unless the student has already chosen an advisor.

Changing graduate research advisors

The faculty recognizes that under certain circumstances there may be valid reasons for a graduate student to want to change his/her research advisor (e.g. lack of funding, personality conflicts, change in the direction of the research program, or resignation of the PI from the faculty). If a student requests change in the graduate research advisor, the program will make every effort to be helpful and to ensure that this is not a traumatic experience for the student. However, it may result in a change of financial support and may also increase the time required to complete the degree. The following procedure should be followed when a graduate student wants to change his/her research advisor.

a. The graduate student must inform the research advisor in writing and give reasons.

b. The graduate research advisor will meet with the student within 1 week to discuss options available. The student then has one additional week to decide to move forward with the change of advisors.
c. The graduate advisor will inform the chair of the Executive Committee. They will help the student to identify a new graduate advisor.
d. The student will be responsible for securing another graduate student advisor and funding for the new project.
e. Concerns regarding intellectual property rights and obligations to funding agencies should be resolved before the student begins his/her work on a new dissertation topic.

Policy on Conflict of Interest
If a faculty advisor has a conflict of interest, the Graduate Group Chair and Graduate Dean must be notified in writing. The Graduate Group Chair will then examine the potential impact upon the student. If there is a potential harm to the student, then an additional faculty member, termed the "Oversight Member", will be appointed by the Graduate Dean to the student's advisory committee to insure that the faculty conflict does not impact the academic interest of the student. If the "Oversight Member" perceives an academic problem related to the conflict of interest that cannot be resolved at the academic unit level, then the matter will be turned over to the Graduate Dean for resolution.

The University of CA is currently developing a policy to deal with matters involving cases where a student may be the conflicted party. These would include instances involving a student who holds a financial interest in an outside entity that may have an interest in a project on which the student is or may be working. In such cases, it is important to consult with the campus Conflict of Interest Oversight Committee or the Vice Chancellor for Research/Graduate Dean.

IV.D. COURSEWORK REQUIREMENTS

All graduate students in the Biological Engineering and Small-scale Technologies group are required to take either Special Topics in Bioengineering (BEST 200) or Special Topics in Materials and Technology (BEST 201) that exposes them to current, cutting-edge research directions in the field. These are 3-unit per semester courses 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. These courses are considered "core" to the program and may not be substituted or waived.

Responsible Conduct in Research (BEST 294) is required and should be taken during the student's first semester in residence.

Research Seminar (BEST 291) attendance is also critical for the graduate student's education. Students are required to register for this 1-unit course at least once per year in residence. A graduate student is defined as "in residence" when registered a full-time during both regular academic sessions within an academic year (included fall and spring semesters, but not summer).
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All PhD students in the group must also successfully complete (grade of B or better) at least ~~three~~ four additional elective courses (~~one~~ three of which must be graduate level course numbered 200-299 and worth at least three units each) exclusive of research (BEST 295) that are appropriate to the student's research area. Suggested courses include Characterization of Materials, Tissue Engineering, Polymeric Materials, Nanotechnology and Nanoscience, Modeling of Nanoscale Processes, Bioinstrumentation, Biophysics, and Electron Microscopy. Graduate-level courses appropriate to the student's specific field of research, including Directed Independent Study (BEST 299) may be used to meet the ~~three~~four-elective course minimum requirement with consent of the student's advisor and faculty committee. Normally

these courses should be taken during the first and second 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.

Transfer of credit

Graduate Group Policies and Procedures in regard to transfer of credit should adhere to the requirements in the Graduate Advisor's Handbook. Note that PhD students may not transfer credit taken towards a graduate degree at another institution, but may petition for a waiver of coursework based on that work, using the process outlined in the Graduate Advisor's Handbook.

IV.E. RESEARCH PROPOSAL

One month before the qualifying exam, the student will provide to the degree committee a written document (typically five to ten pages of a research proposal written in NIH or NSF format) 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 required 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 Biological Engineering and Small-scale Technologies 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 within the first 2 years of graduate study unless they successfully petition the graduate group chair to take it at a specific later date. 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 committee 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 graduate research advisor may attend the qualifying exam if he/she wishes, but is a non-speaking and nonvoting attendant.

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 or engineering (including biology, chemistry, physics, fluid mechanics, thermodynamics, behavior of materials, electronics, and kinetics), 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
2. Fail, with an option to retake the examination once within a specified time period
3. Fail, with no option to retake the examination.

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 "Conditional 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 "Conditional 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.

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 advisor, 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. SEMINAR PRESENTATIONS

All students in the Biological Engineering and Small-scale Technologies 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.

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 Biological Engineering and Small-scale Technologies 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 Biological Engineering and Small-scale Technologies 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 two of the group's graduate core courses, plus one additional 200-299 level course 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 9 semester hours must be from regular, letter-graded lecture courses (including the core courses), while the remaining hours may be research or similar courses;
- Prepare an acceptable thesis describing original research in the field and successfully defend thesis to thesis committee.

Note: A carefully designed program starting with undergraduate research at UCM can permit a student to complete the M.S. degree one year sooner than is otherwise possible. This degree requires at least two additional semesters of full-time academic residence at UC Merced. Note: BEST graduate program will waive the GRE exam requirement for UC, Merced undergraduate students.

COURSEWORK REQUIREMENTS FOR PLAN I

All graduate students in the Biological Engineering and Small-scale Technologies group are required to take either Special Topics in Bioengineering (BEST 200) or Special Topics in Materials and Technology (BEST 201) that exposes them to current, cutting-edge research directions in the field. These are 3-unit per semester courses 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. These courses are considered "core" to the program and may not be substituted or waived.

Responsible Conduct in Research (BEST 294) is required and should be taken during the student's first semester in residence.

Research Seminar (BEST 291) attendance is also critical for the graduate student's education. Students are required to register for this 1-unit course at least once per year in residence. A graduate student is

defined as "in residence" when registered a full-time during both regular academic sessions within an academic year (included fall and spring semesters, but not summer).

PLAN II

- Complete at least two semesters of full-time academic residence (12 units minimum) at UC Merced;
- Complete at least 2 of the group's graduate core courses, plus 3 additional 200-299 level 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 12 semester hours must be from regular, letter-graded lecture courses (including the core courses), while the remaining 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.

COURSEWORK REQUIREMENTS FOR PLAN II

All graduate students in the Biological Engineering and Small-scale Technologies group are required to take either Special Topics in Bioengineering (BEST 200) or Special Topics in Materials and Technology (BEST 201) that exposes them to current, cutting-edge research directions in the field. These are 3-unit per semester courses 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. These courses are considered "core" to the program and may not be substituted or waived.

Research Seminar (BEST 291) attendance is also critical for the graduate student's education. Students are required to register for this 1-unit course each year in residence.

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

The Biological Engineering and Small-scale Technologies 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 Executive Committee.

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

To the extent available resources allow, financial support will be provided for Ph.D. students, and is normally offered as stipend support in the form of either Teaching Assistants (TAs) or Graduate Student Researchers (GSRs). Students in their first semester of residence usually serve as TAs for appropriate courses in the schools of Natural Sciences or Engineering. After the first semester, support may be offered through either funding as a TA or a GSR in the graduate research advisor's laboratory. TA stipends are set by the schools while GSR 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 this teaching.

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

University of California, Merced

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I. SCOPE OF RESEARCH

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graduate education and will be evaluated by the admissions committee. Foreign students from non-English speaking countries are required to attain:

1. **TOEFL or IELTS Scores:** All graduate applicants -- regardless of citizenship -- whose preparatory education was principally in a language other than English, must show evidence of having recently taken the Test of English as a Foreign Language (TOEFL) **or** the International English Language Testing Service (IELTS) examination. Please note that TOEFL and IELTS scores expire two years after the test date. The minimum requirements are as follows:
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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 BEST 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 "B-", 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 BEST 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 Biological Engineering and Small-scale Technologies 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 Biological Engineering and Small-scale Technologies 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 reviewed and approved by the Chair and Graduate Dean.

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 Biological Engineering and Small-scale Technologies 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 five graduate courses of three-four units each (exclusive of research) (see section IV.D);
- Complete all graduate courses with a letter grade of at least "B";
- Serve as a Teaching Assistant (TA) 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 Biological Engineering and Small-scale Technologies 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 Biological Engineering and Small-scale Technologies group. Students will be assigned an initial advisor when they first enroll, unless the student has already chosen an advisor.

Changing graduate research advisors

The faculty recognizes that under certain circumstances there may be valid reasons for a graduate student to want to change his/her research advisor (e.g. lack of funding, personality conflicts, change in the direction of the research program, or resignation of the PI from the faculty). If a student requests change in the graduate research advisor, the program will make every effort to be helpful and to ensure that this is not a traumatic experience for the student. However, it may result in a change of financial support and may also increase the time required to complete the degree. The following procedure should be followed when a graduate student wants to change his/her research advisor.

a. The graduate student must inform the research advisor in writing and give reasons.

b. The graduate research advisor will meet with the student within 1 week to discuss options available. The student then has one additional week to decide to move forward with the change of advisors.
c. The graduate advisor will inform the chair of the Executive Committee. They will help the student to identify a new graduate advisor.
d. The student will be responsible for securing another graduate student advisor and funding for the new project.
e. Concerns regarding intellectual property rights and obligations to funding agencies should be resolved before the student begins his/her work on a new dissertation topic.

Policy on Conflict of Interest
If a faculty advisor has a conflict of interest, the Graduate Group Chair and Graduate Dean must be notified in writing. The Graduate Group Chair will then examine the potential impact upon the student. If there is a potential harm to the student, then an additional faculty member, termed the "Oversight Member", will be appointed by the Graduate Dean to the student's advisory committee to insure that the faculty conflict does not impact the academic interest of the student. If the "Oversight Member" perceives an academic problem related to the conflict of interest that cannot be resolved at the academic unit level, then the matter will be turned over to the Graduate Dean for resolution.

The University of CA is currently developing a policy to deal with matters involving cases where a student may be the conflicted party. These would include instances involving a student who holds a financial interest in an outside entity that may have an interest in a project on which the student is or may be working. In such cases, it is important to consult with the campus Conflict of Interest Oversight Committee or the Vice Chancellor for Research/Graduate Dean.

IV.D. COURSEWORK REQUIREMENTS

All graduate students in the Biological Engineering and Small-scale Technologies group are required to take either Special Topics in Bioengineering (BEST 200) or Special Topics in Materials and Technology (BEST 201) that exposes them to current, cutting-edge research directions in the field. These are 3-unit per semester courses 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. These courses are considered "core" to the program and may not be substituted or waived.

Responsible Conduct in Research (BEST 294) is required and should be taken during the student's first semester in residence.

Research Seminar (BEST 291) attendance is also critical for the graduate student's education. Students are required to register for this 1-unit course at least once per year in residence. A graduate student is defined as "in residence" when registered a full-time during both regular academic sessions within an academic year (included fall and spring semesters, but not summer).
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All PhD students in the group must also successfully complete (grade of B or better) at least four additional elective courses (three of which must be graduate level course numbered 200-299 and worth at least three units each) exclusive of research (BEST 295) that are appropriate to the student's research area. Suggested courses include Characterization of Materials, Tissue Engineering, Polymeric Materials, Nanotechnology and Nanoscience, Modeling of Nanoscale Processes, Bioinstrumentation, Biophysics, and Electron Microscopy. Graduate-level courses appropriate to the student's specific field of research, including Directed Independent Study (BEST 299) may be used to meet the four-elective course minimum requirement with consent of the student's advisor and faculty committee. Normally these courses should

be taken during the first and second 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.

Transfer of credit

Graduate Group Policies and Procedures in regard to transfer of credit should adhere to the requirements in the Graduate Advisor's Handbook. Note that PhD students may not transfer credit taken towards a graduate degree at another institution, but may petition for a waiver of coursework based on that work, using the process outlined in the Graduate Advisor's Handbook.

IV.E. RESEARCH PROPOSAL

One month before the qualifying exam, the student will provide to the degree committee a written document (typically five to ten pages of a research proposal written in NIH or NSF format) 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 required 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 Biological Engineering and Small-scale Technologies 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 within the first 2 years of graduate study unless they successfully petition the graduate group chair to take it at a specific later date. 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 committee 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 graduate research advisor may attend the qualifying exam if he/she wishes, but is a non-speaking and nonvoting attendant.

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 or engineering (including biology, chemistry, physics, fluid mechanics, thermodynamics, behavior of materials, electronics, and kinetics), 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
2. Fail, with an option to retake the examination once within a specified time period
3. Fail, with no option to retake the examination.

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 "Conditional 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 "Conditional 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.

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 advisor, 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. SEMINAR PRESENTATIONS

All students in the Biological Engineering and Small-scale Technologies 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.

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 Biological Engineering and Small-scale Technologies 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 Biological Engineering and Small-scale Technologies 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 two of the group's graduate core courses, plus one additional 200-299 level course 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 9 semester hours must be from regular, letter-graded lecture courses (including the core courses), while the remaining hours may be research or similar courses;
- Prepare an acceptable thesis describing original research in the field and successfully defend thesis to thesis committee.

Note: A carefully designed program starting with undergraduate research at UCM can permit a student to complete the M.S. degree one year sooner than is otherwise possible. This degree requires at least two additional semesters of full-time academic residence at UC Merced. Note: BEST graduate program will waive the GRE exam requirement for UC, Merced undergraduate students.

COURSEWORK REQUIREMENTS FOR PLAN I

All graduate students in the Biological Engineering and Small-scale Technologies group are required to take either Special Topics in Bioengineering (BEST 200) or Special Topics in Materials and Technology (BEST 201) that exposes them to current, cutting-edge research directions in the field. These are 3-unit per semester courses 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. These courses are considered "core" to the program and may not be substituted or waived.

Responsible Conduct in Research (BEST 294) is required and should be taken during the student's first semester in residence.

Research Seminar (BEST 291) attendance is also critical for the graduate student's education. Students are required to register for this 1-unit course at least once per year in residence. A graduate student is

defined as "in residence" when registered a full-time during both regular academic sessions within an academic year (included fall and spring semesters, but not summer).

PLAN II

- Complete at least two semesters of full-time academic residence (12 units minimum) at UC Merced;
- Complete at least 2 of the group's graduate core courses, plus 3 additional 200-299 level 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 12 semester hours must be from regular, letter-graded lecture courses (including the core courses), while the remaining 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.

COURSEWORK REQUIREMENTS FOR PLAN II

All graduate students in the Biological Engineering and Small-scale Technologies group are required to take either Special Topics in Bioengineering (BEST 200) or Special Topics in Materials and Technology (BEST 201) that exposes them to current, cutting-edge research directions in the field. These are 3-unit per semester courses 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. These courses are considered "core" to the program and may not be substituted or waived.

Research Seminar (BEST 291) attendance is also critical for the graduate student's education. Students are required to register for this 1-unit course each year in residence.

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

The Biological Engineering and Small-scale Technologies 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 Executive Committee.

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

To the extent available resources allow, financial support will be provided for Ph.D. students, and is normally offered as stipend support in the form of either Teaching Assistants (TAs) or Graduate Student Researchers (GSRs). Students in their first semester of residence usually serve as TAs for appropriate courses in the schools of Natural Sciences or Engineering. After the first semester, support may be offered through either funding as a TA or a GSR in the graduate research advisor's laboratory. TA stipends are set by the schools while GSR 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 this teaching.

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